Q1 Where do you use C++? (select all that apply)
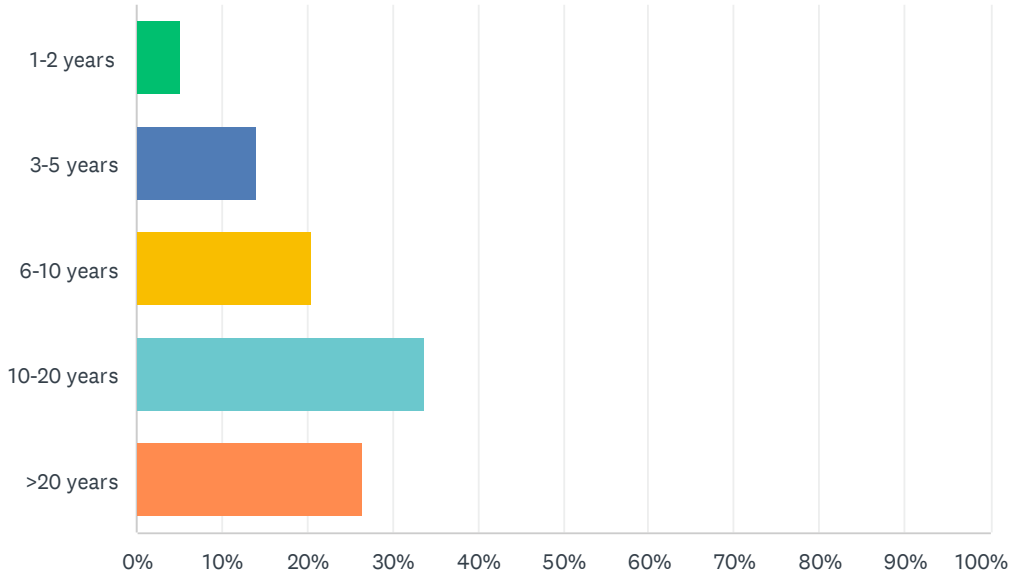
Answered: 1,262   Skipped: 3
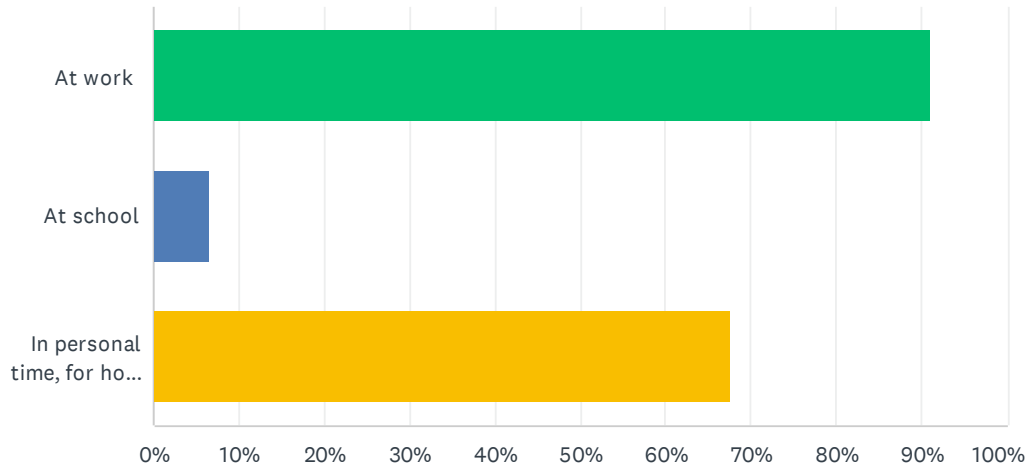
ANSWER CHOICES	RESPONSES	
At work	91.05%	1,149
At school	6.58%	83
In personal time, for hobby projects or to try new things	67.59%	853
Total Respondents: 1,262		

Q2 How many years of programming experience do you have in C++ specifically?
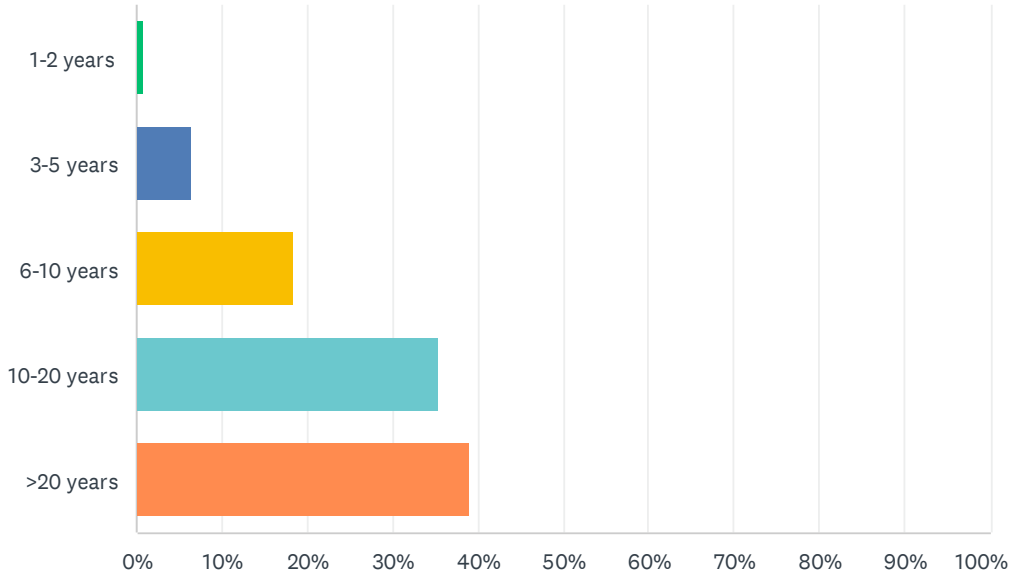
Answered: 1,262   Skipped: 3

ANSWER CHOICES	RESPONSES	
1-2 years	5.15%	65
3-5 years	14.10%	178
6-10 years	20.52%	259
10-20 years	33.68%	425
>20 years	26.55%	335
TOTAL		1,262

Q3 How many years of programming experience do you have overall (all languages)?

Answered: 1,255   Skipped: 10

ANSWER CHOICES	RESPONSES	
1-2 years	0.88%	11
3-5 years	6.45%	81
6-10 years	18.25%	229
10-20 years	35.38%	444
>20 years	39.04%	490
TOTAL		1,255

Q4 What types of projects do you work on? (select all that apply)

Answered: 1,260   Skipped: 5
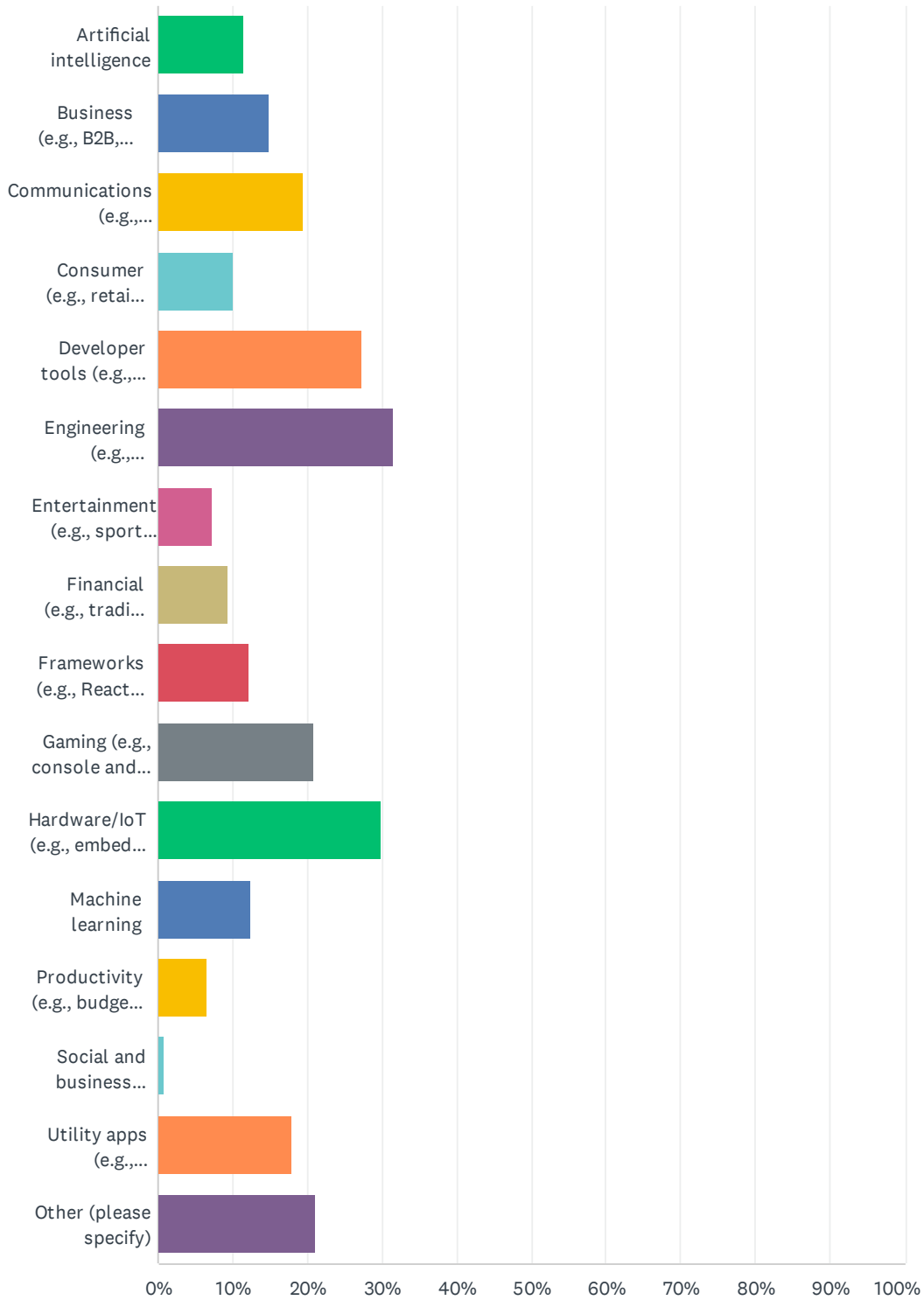
ANSWER CHOICES	RESPONSES	
Artificial intelligence	11.59%	146
Business (e.g., B2B, B2E)	15.00%	189
Communications (e.g., networking, email)	19.37%	244
Consumer (e.g., retail websites, mobile apps)	9.92%	125
Developer tools (e.g., compilers, code editors)	27.38%	345
Engineering (e.g., avionics, power management)	31.51%	397
Entertainment (e.g., sports apps, video streaming)	7.30%	92
Financial (e.g., trading, mortgage, asset management)	9.44%	119
Frameworks (e.g., React, Unity)	12.22%	154
Gaming (e.g., console and mobile games)	20.87%	263
Hardware/IoT (e.g., embedded systems, home automation)	29.92%	377
Machine learning	12.46%	157
Productivity (e.g., budget tracking, note taking)	6.51%	82
Social and business networking (e.g., Facebook, Twitter)	0.87%	11
Utility apps (e.g., calculators, simple image editors)	17.94%	226
Other (please specify)	21.19%	267
Total Respondents: 1,260		

Q5 What platforms do you develop for? (select all that apply)

Answered: 1,260   Skipped: 5
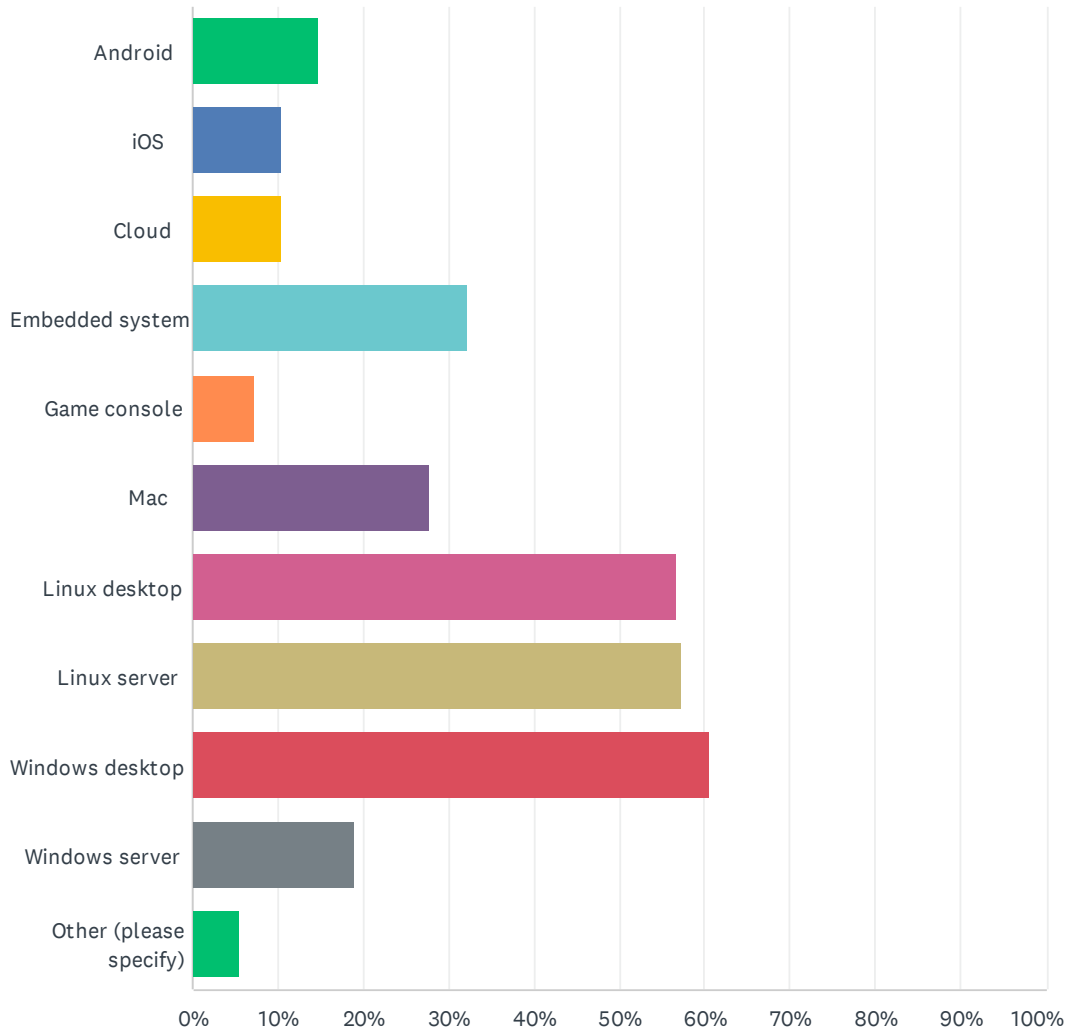
2024 Annual C++ Developer Survey "Lite"

ANSWER CHOICES	RESPONSES	
Android	14.68%	185
iOS	10.48%	132
Cloud	10.40%	131
Embedded system	32.22%	406
Game console	7.30%	92
Mac	27.70%	349
Linux desktop	56.75%	715
Linux server	57.30%	722
Windows desktop	60.56%	763
Windows server	19.05%	240
Other (please specify)	5.56%	70
Total Respondents: 1,260		

Q6 Which of these do you find frustrating about C++ development?

Answered: 1,261   Skipped: 4
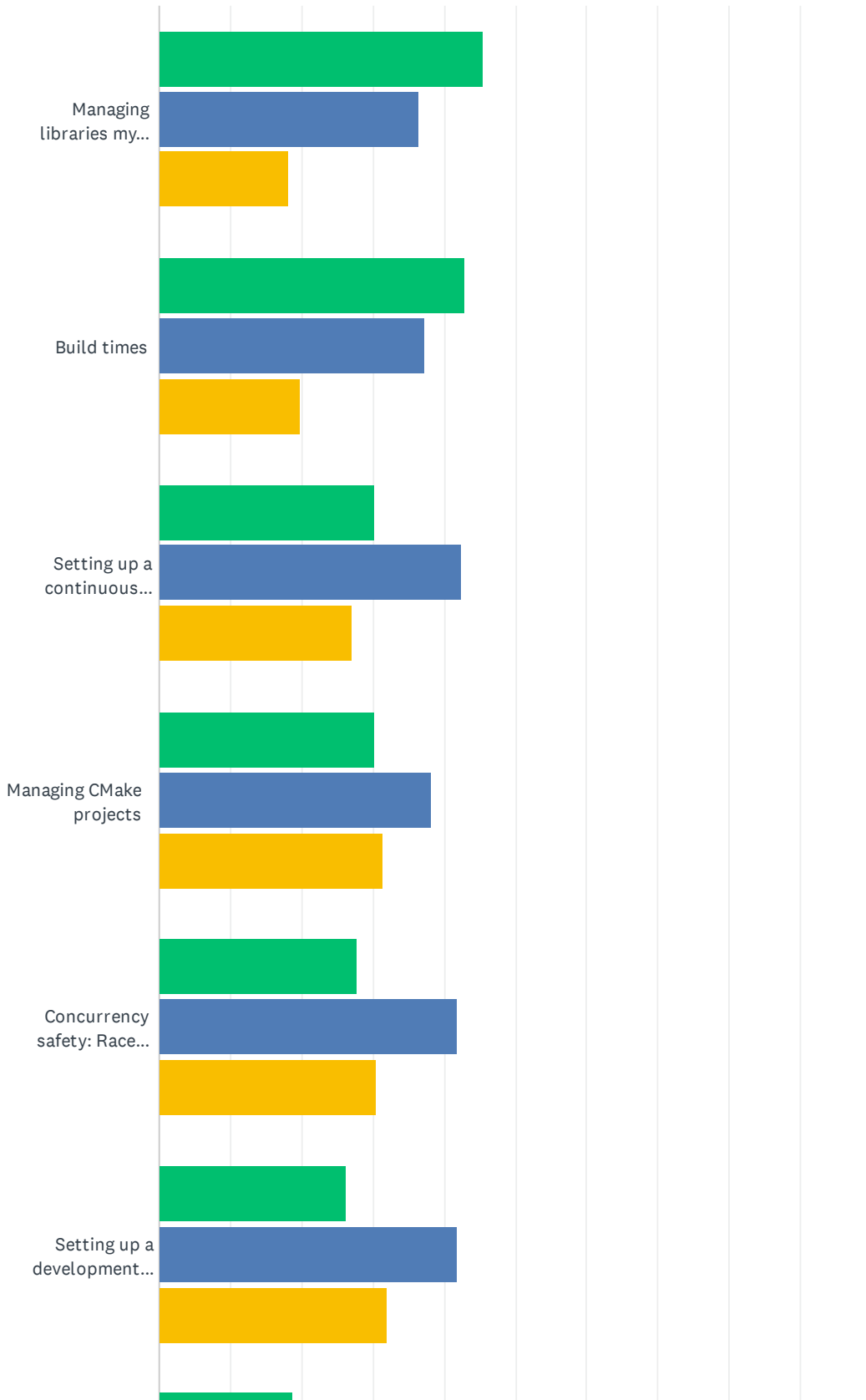
2024 Annual C++ Developer Survey "Lite"

Debugging issues in my...

Parallelism support: Usi...

Memory safety: Bounds safet...

Memory safety: Use-after-de...

Managing Makefiles

Unicode, internationa...

Type safety: Using an obj...

2024 Annual C++ Developer Survey "Lite"

Security
issues:...

Memory safety:
Forgot to...

Managing
MSBuild...

Moving
existing cod...

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
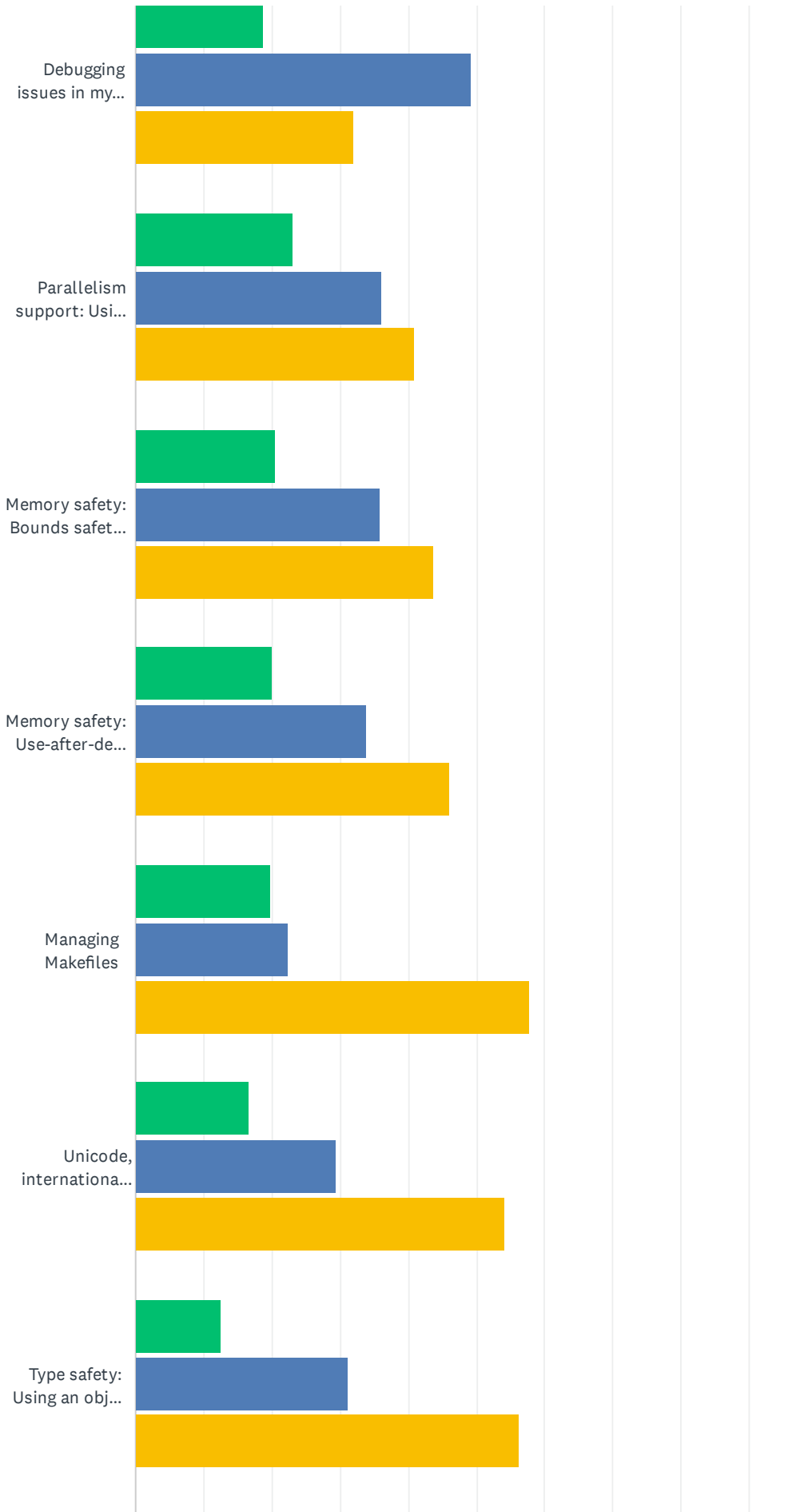
■ Major pain ...   ■ Minor pain ...   ■ Not a signi...
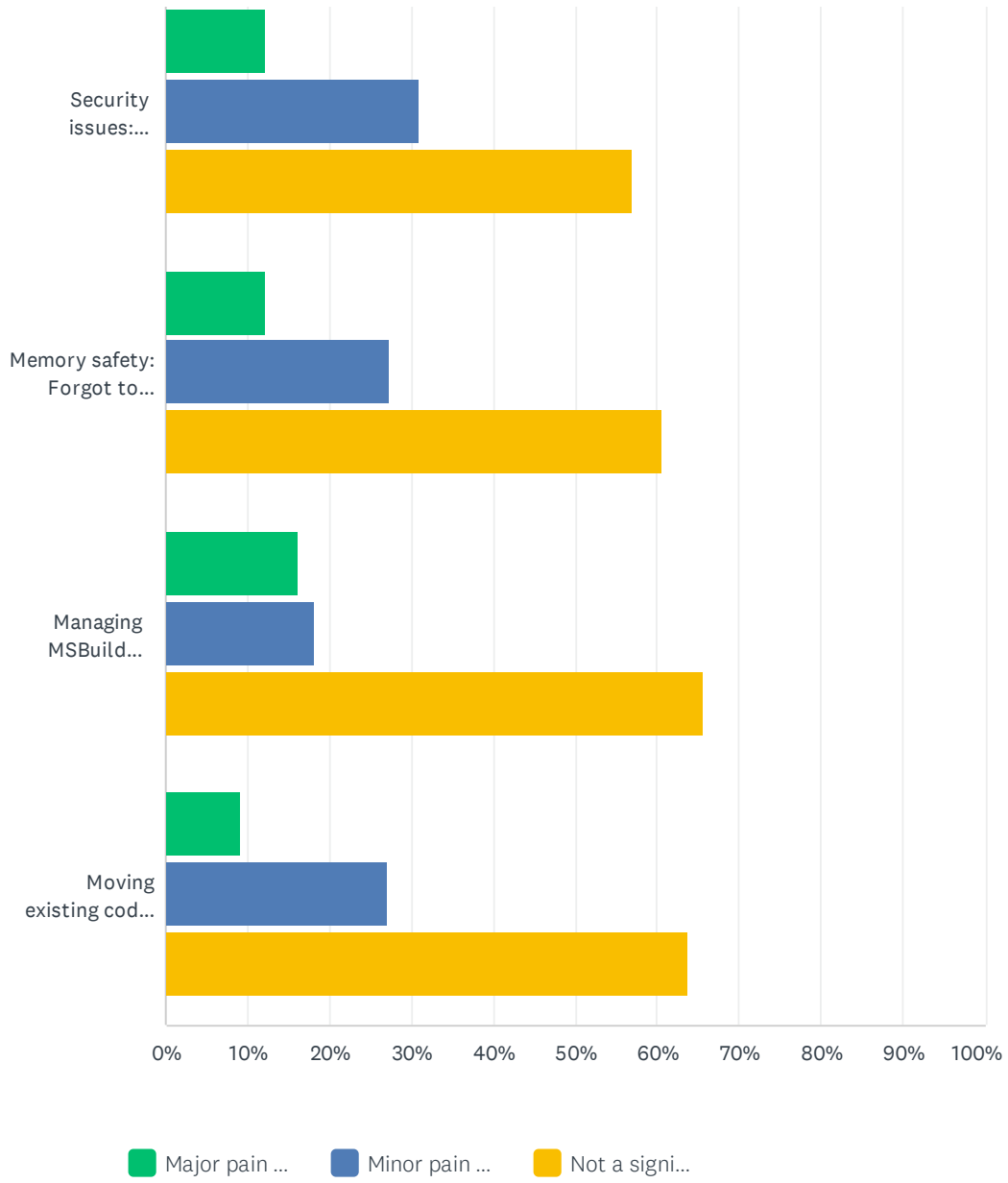
2024 Annual C++ Developer Survey "Lite"

|	MAJOR PAIN POINT	MINOR PAIN POINT	NOT A SIGNIFICANT ISSUE FOR ME	TOTAL	WEIGHTED AVERAGE
Managing libraries my application depends on	45.43% 571	36.44% 458	18.14% 228	1,257	2.27
Build times	42.86% 537	37.35% 468	19.79% 248	1,253	2.23
Setting up a continuous integration pipeline from scratch (automated builds, tests, …)	30.35% 376	42.53% 527	27.12% 336	1,239	2.03
Managing CMake projects	30.38% 377	38.20% 474	31.43% 390	1,241	1.99
Concurrency safety: Races, deadlocks, performance bottlenecks	27.67% 347	41.87% 525	30.46% 382	1,254	1.97
Setting up a development environment from scratch (compiler, build system, IDE, …)	26.27% 330	41.80% 525	31.93% 401	1,256	1.94
Debugging issues in my code	18.77% 234	49.24% 614	32.00% 399	1,247	1.87
Parallelism support: Using more CPU/GPU/other cores to compute an answer faster	22.94% 286	36.09% 450	40.98% 511	1,247	1.82
Memory safety: Bounds safety issues (read/write beyond the bounds of an object or array)	20.48% 257	35.86% 450	43.67% 548	1,255	1.77
Memory safety: Use-after-delete/free (dangling pointers, iterators, spans, …)	20.03% 251	34.00% 426	45.97% 576	1,253	1.74
Managing Makefiles	19.88% 235	22.42% 265	57.70% 682	1,182	1.62
Unicode, internationalization, and localization	16.56% 205	29.32% 363	54.12% 670	1,238	1.62
Type safety: Using an object as the wrong type (unsafe downcasts, unsafe unions, …)	12.63% 158	31.18% 390	56.20% 703	1,251	1.56
Security issues: Overlaps with "safety" but includes other issues (secret disclosure, vulnerabilities, exploits, …)	12.25% 153	30.82% 385	56.93% 711	1,249	1.55
Memory safety: Forgot to delete/free (memory leaks)	12.22% 153	27.32% 342	60.46% 757	1,252	1.52
Managing MSBuild projects	16.20% 193	18.05% 215	65.74% 783	1,191	1.50
Moving existing code to the latest language standard	9.08% 114	27.15% 341	63.77% 801	1,256	1.45

	MAJOR PAIN POINT	MINOR PAIN POINT	NOT A SIGNIFICANT ISSUE FOR ME	TOTAL	WEIGHTED AVERAGE

Q7 In the past year, what things in the C++ world (in standards, projects, conferences, articles, etc.) are you most excited about / make you feel positive about C++ and its future? Why?

Answered: 824   Skipped: 441

Q8 In the past year, what things in the C++ world (in standards, projects, conferences, articles, etc.) are you most concerned about / make you feel negative about C++ and its future? Why?

Answered: 805   Skipped: 460

Q9 How do you manage your C++ 1st and 3rd party libraries? (Check all that apply)

Answered: 1,246   Skipped: 19
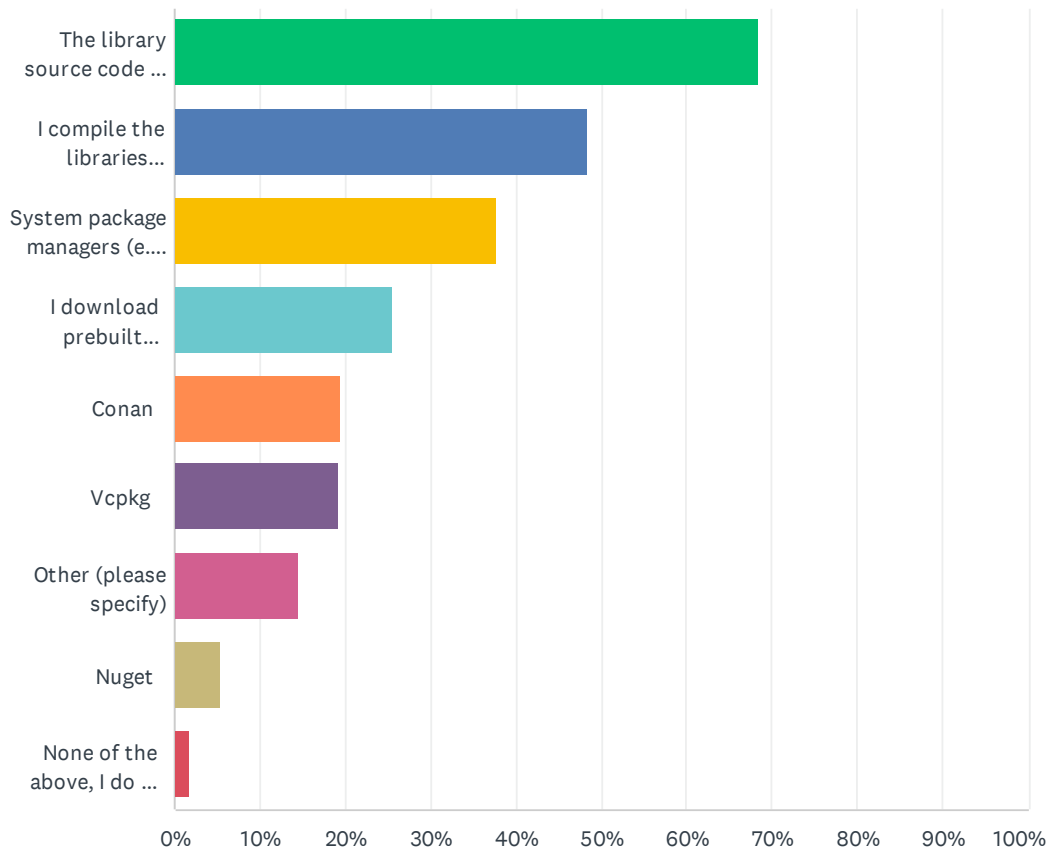
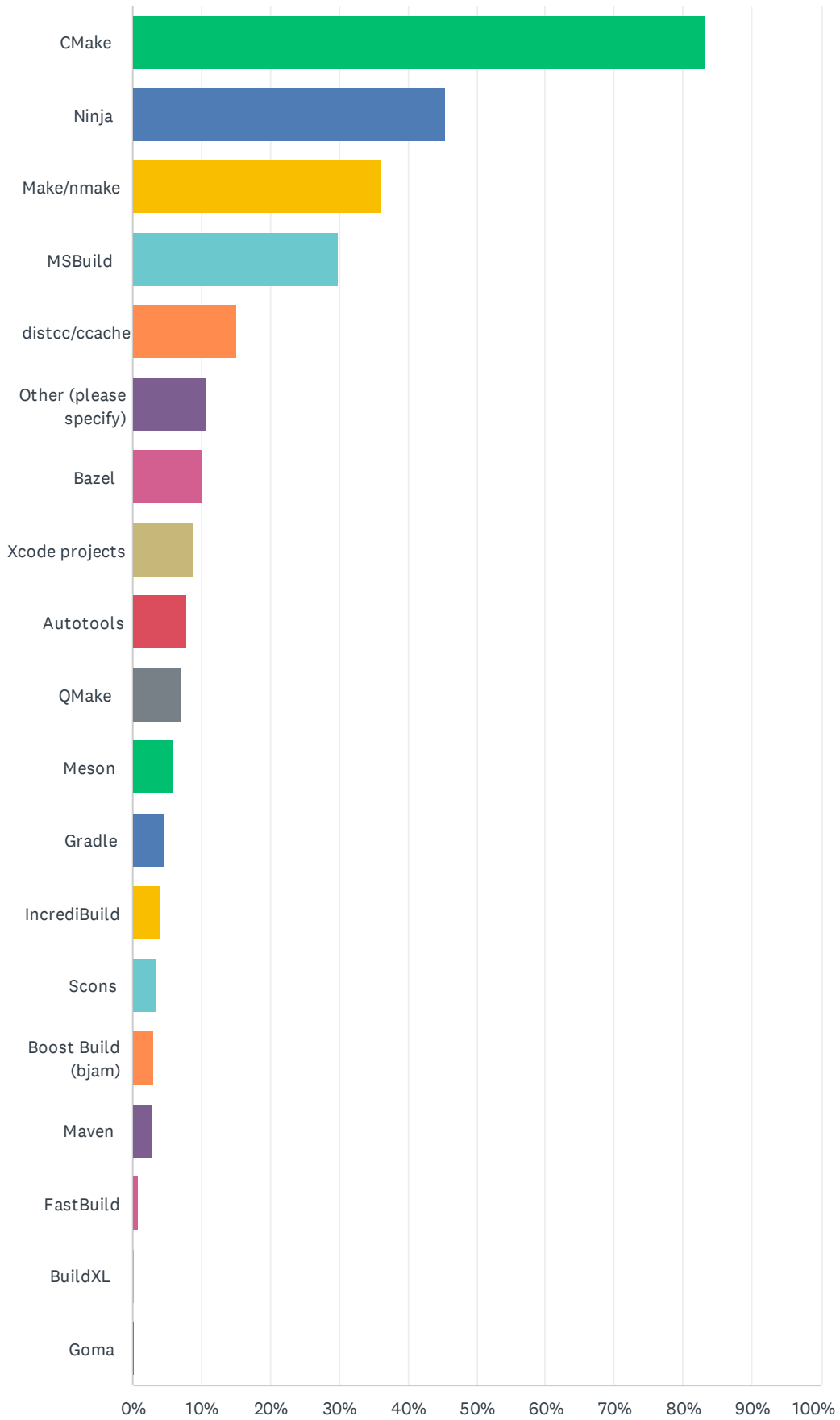| ANSWER CHOICES	RESPONSES	
The library source code is part of my build	68.54%	854
I compile the libraries separately using their instructions	48.48%	604
System package managers (e.g., apt, brew, …)	37.80%	471
I download prebuilt libraries from the Internet	25.60%	319
Conan	19.34%	241
Vcpkg	19.10%	238
Other (please specify)	14.53%	181
Nuget	5.30%	66
None of the above, I do not have any dependencies	1.69%	21
Total Respondents: 1,246		

Q10 What build tools do you use? (Check all that apply)

Answered: 1,253   Skipped: 12

2024 Annual C++ Developer Survey "Lite"

2024 Annual C++ Developer Survey "Lite"

ANSWER CHOICES	RESPONSES	
CMake	83.24%	1,043
Ninja	45.41%	569
Make/nmake	36.31%	455
MSBuild	29.77%	373
distcc/ccache	15.16%	190
Other (please specify)	10.61%	133
Bazel	9.98%	125
Xcode projects	8.70%	109
Autotools	7.98%	100
QMake	7.10%	89
Meson	5.99%	75
Gradle	4.71%	59
IncrediBuild	4.15%	52
Scons	3.43%	43
Boost Build (bjam)	3.03%	38
Maven	2.71%	34
FastBuild	0.96%	12
BuildXL	0.32%	4
Goma	0.16%	2
Total Respondents: 1,253		

Q11 What parts of your development lifecycle use the cloud? (Check all that apply)
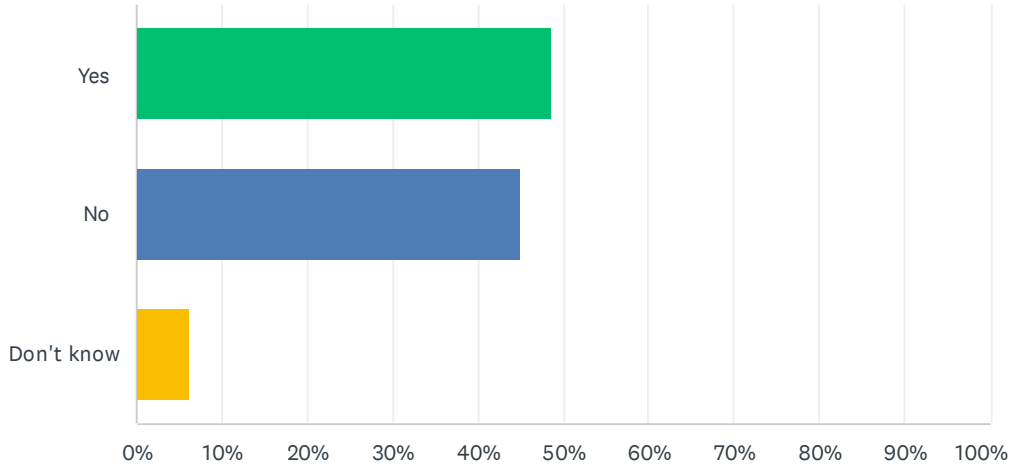
Answered: 1,230   Skipped: 35
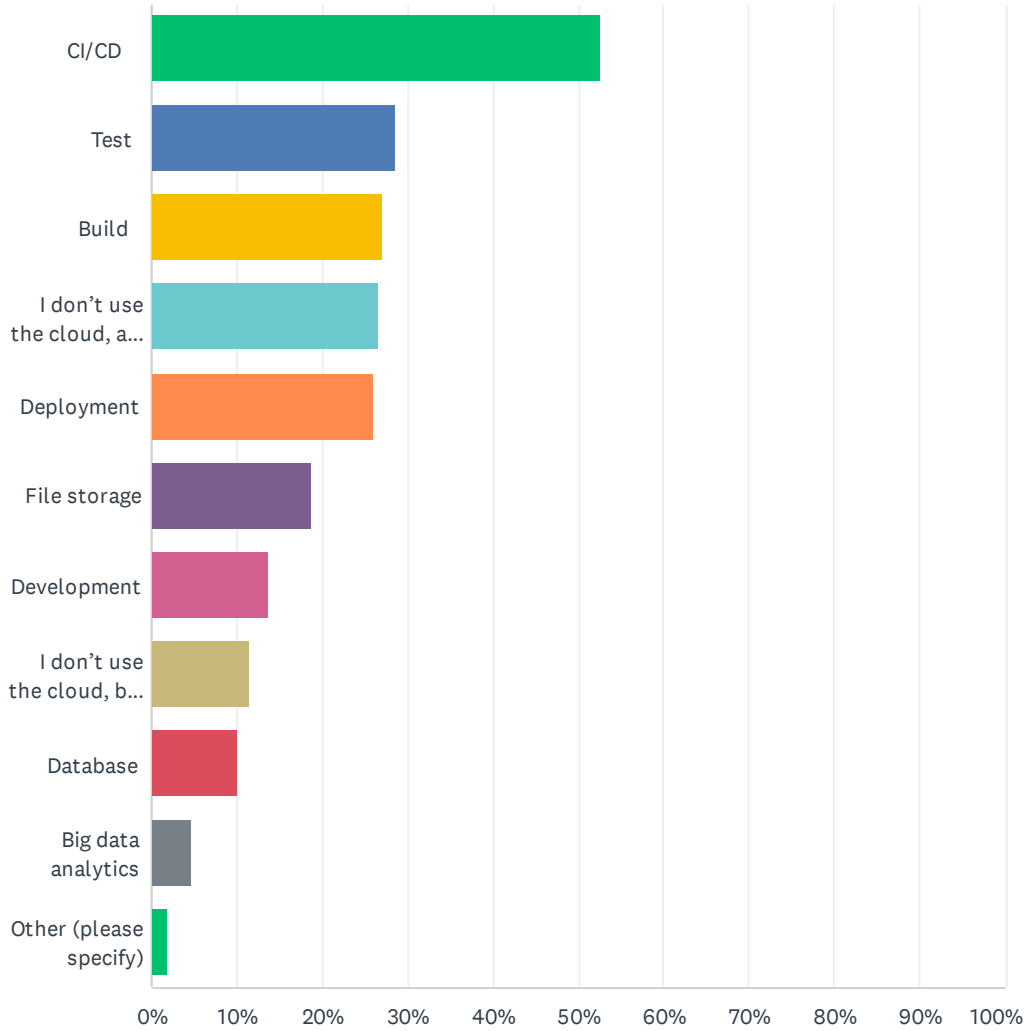
ANSWER CHOICES	RESPONSES	
CI/CD	52.76%	649
Test	28.62%	352
Build	27.07%	333
I don't use the cloud, and I am not interested	26.67%	328
Deployment	25.93%	319
File storage	18.70%	230
Development	13.66%	168
I don't use the cloud, but I am interested	11.54%	142
Database	10.08%	124
Big data analytics	4.72%	58
Other (please specify)	1.95%	24
Total Respondents: 1,230		

Q12 Does your current project use sanitizers and/or fuzzing as part of its normal development and release cycle?

Answered: 1,251   Skipped: 14

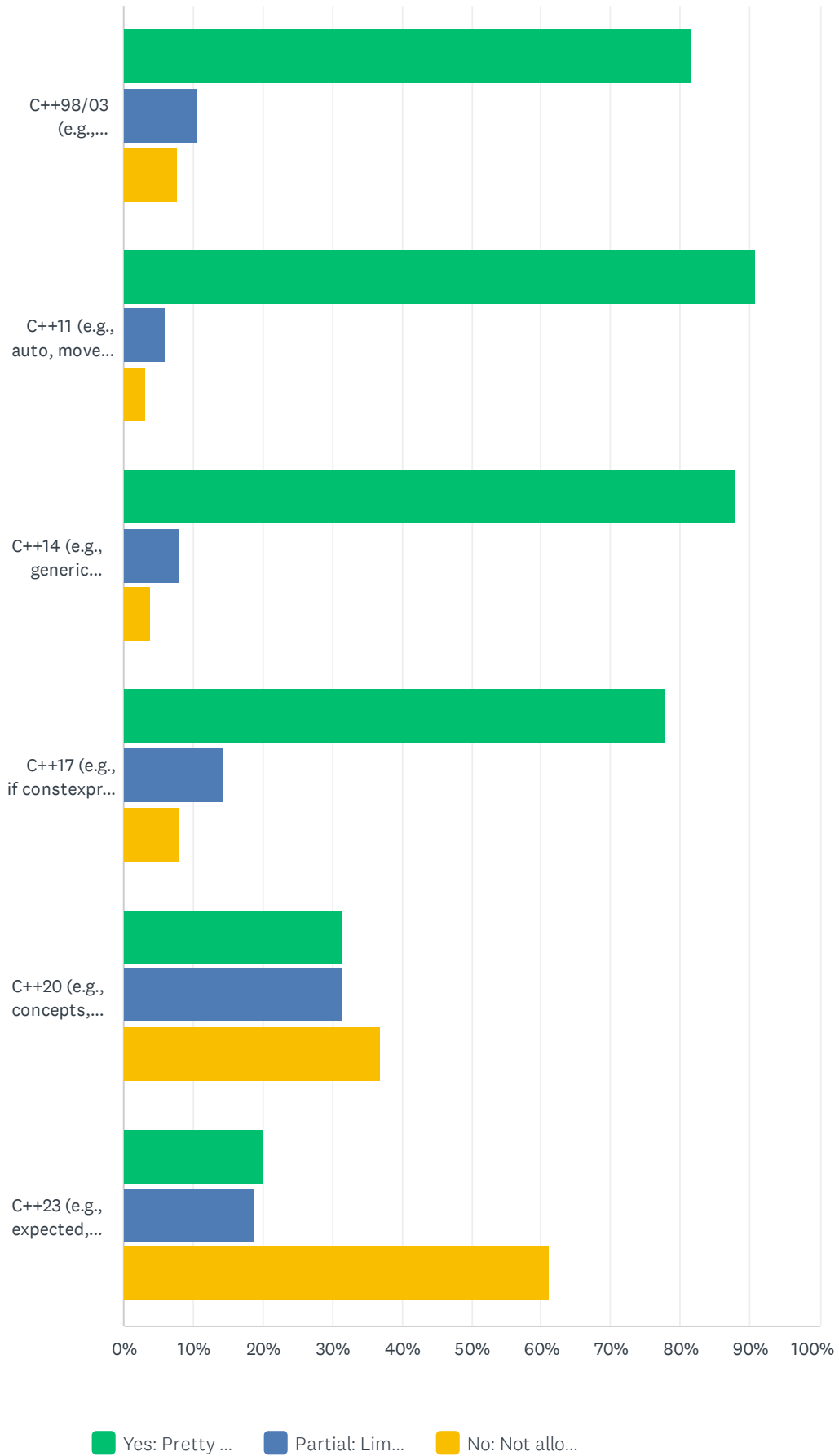| ANSWER CHOICES	RESPONSES	
Yes	48.68%	609
No	45.08%	564
Don't know	6.24%	78
TOTAL		1,251

Q13 What version(s) of C++ are you allowed to use on your current project (work or school)?

Answered: 1,253   Skipped: 12

2024 Annual C++ Developer Survey "Lite"

Legend:
- Yes: Pretty ...
- Partial: Lim...
- No: Not allo...

Categories (top to bottom):
- C++98/03 (e.g.,...
- C++11 (e.g., auto, move...
- C++14 (e.g., generic...
- C++17 (e.g., if constexpr...
- C++20 (e.g., concepts,...
- C++23 (e.g., expected,...

X-axis: 0% to 100%

	YES: PRETTY MUCH ALL	PARTIAL: LIMITED FEATURES/USAGE	NO: NOT ALLOWED	TOTAL	WEIGHTED AVERAGE
C++98/03 (e.g., exceptions, templates, RTTI)	81.60% 936	10.64% 122	7.76% 89	1,147	2.74
C++11 (e.g., auto, move semantics, =delete/=default, shared_ptr, lambdas)	90.81% 1,057	6.01% 70	3.18% 37	1,164	2.88
C++14 (e.g., generic lambdas, auto return types, general constexpr functions)	87.98% 1,032	8.18% 96	3.84% 45	1,173	2.84
C++17 (e.g., if constexpr, if/switch scoped variables, structured bindings, string_view, optional/any/variant, Parallel STL)	77.79% 942	14.20% 172	8.01% 97	1,211	2.70
C++20 (e.g., concepts, coroutines, modules)	31.61% 378	31.44% 376	36.96% 442	1,196	1.95
C++23 (e.g., expected, md_span)	20.02% 233	18.81% 219	61.17% 712	1,164	1.59

	YES: PRETTY MUCH ALL	PARTIAL: LIMITED FEATURES/USAGE	NO: NOT ALLOWED	TOTAL	WEIGHTED AVERAGE

Q14 In the next 12 months, does your current project plan to start allowing additional use of newer C++ standard features (i.e., more than in the previous answer)?
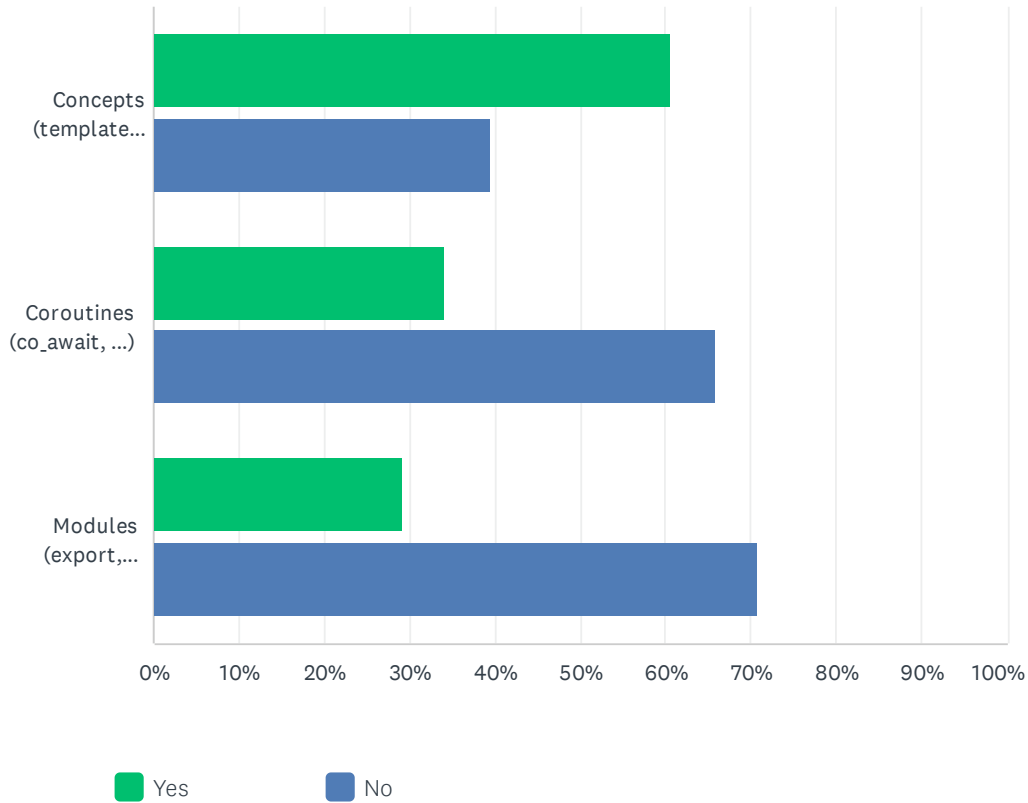
Answered: 1,250   Skipped: 15
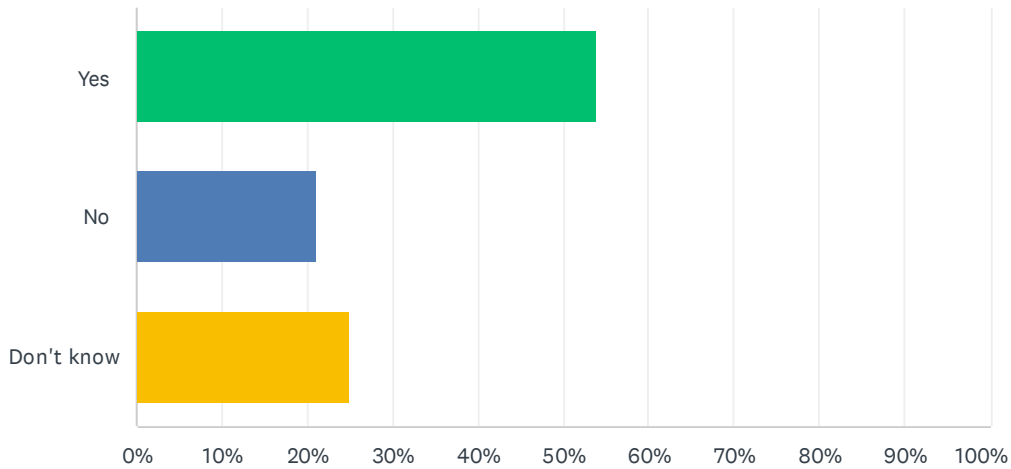
ANSWER CHOICES	RESPONSES	
Yes	53.92%	674
No	21.12%	264
Don't know	24.96%	312
TOTAL		1,250

Q15 Specifically for major C++20/23 features: In the next 12 months, does your current project plan to allow use of these features in production code?
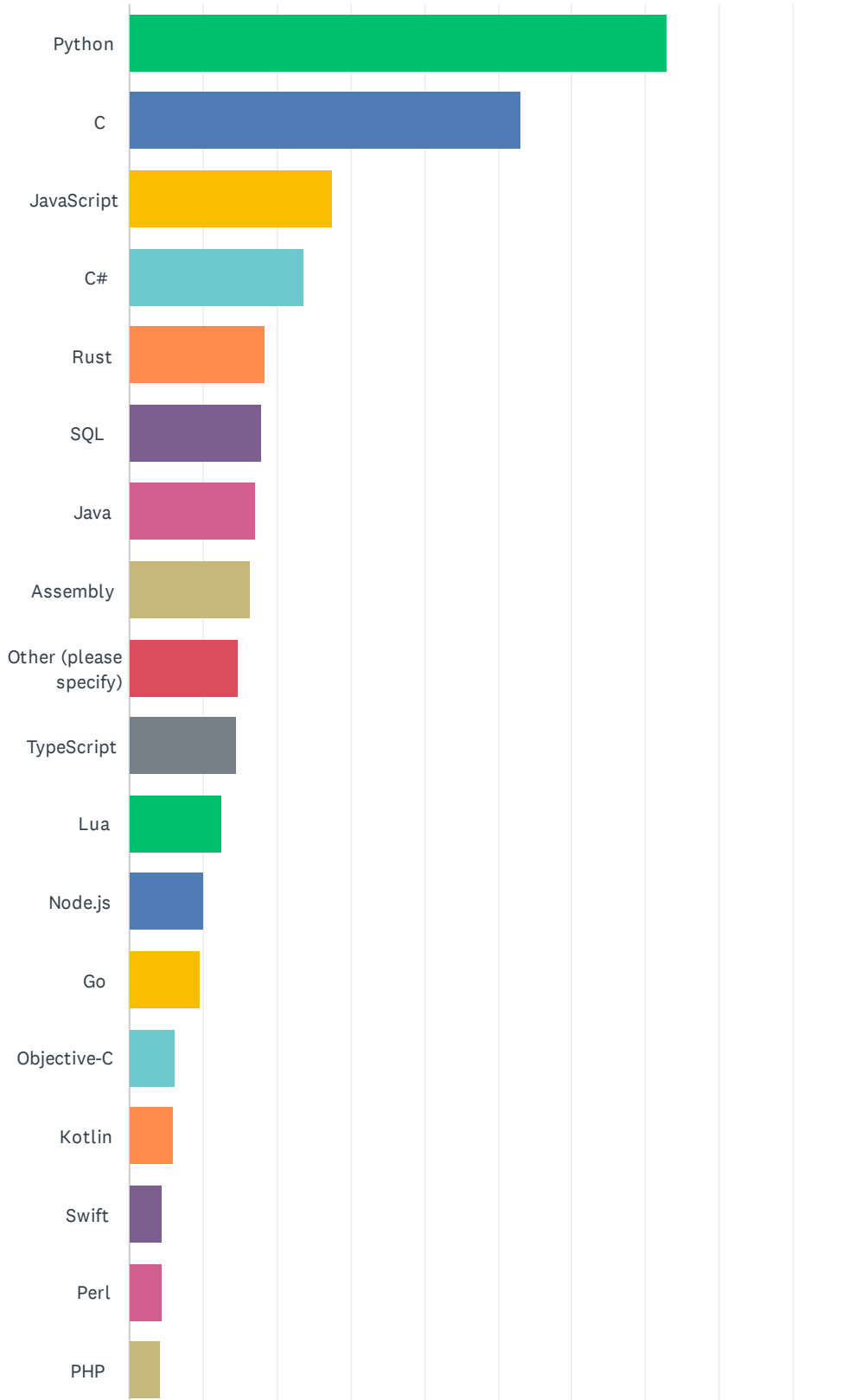
Answered: 1,201   Skipped: 64

	YES	NO	TOTAL	WEIGHTED AVERAGE
Concepts (template constraints, requires, ...)	60.45% 720	39.55% 471	1,191	1.79
Coroutines (co_await, ...)	34.13% 401	65.87% 774	1,175	2.32
Modules (export, import, ...)	29.25% 346	70.75% 837	1,183	2.42

Q16 Besides C++, what programming languages/environments do you use in your current and recent projects? (select all that apply)

Answered: 1,225   Skipped: 40

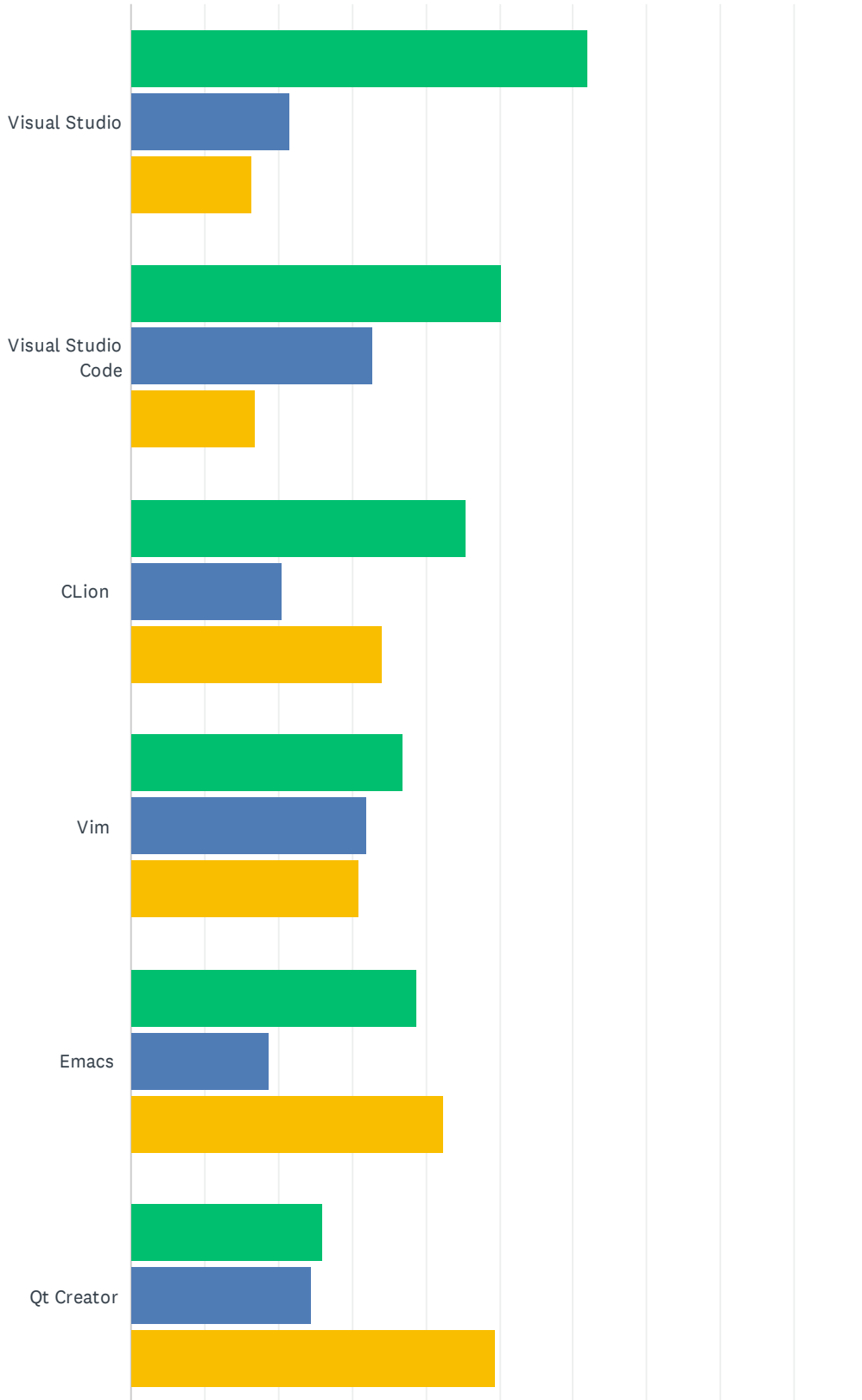# 2024 Annual C++ Developer Survey "Lite"

Haskell	
R	
Groovy	
Ruby	
Scala	
Visual Basic	
D	
F#	

0%   10%   20%   30%   40%   50%   60%   70%   80%   90%   100%
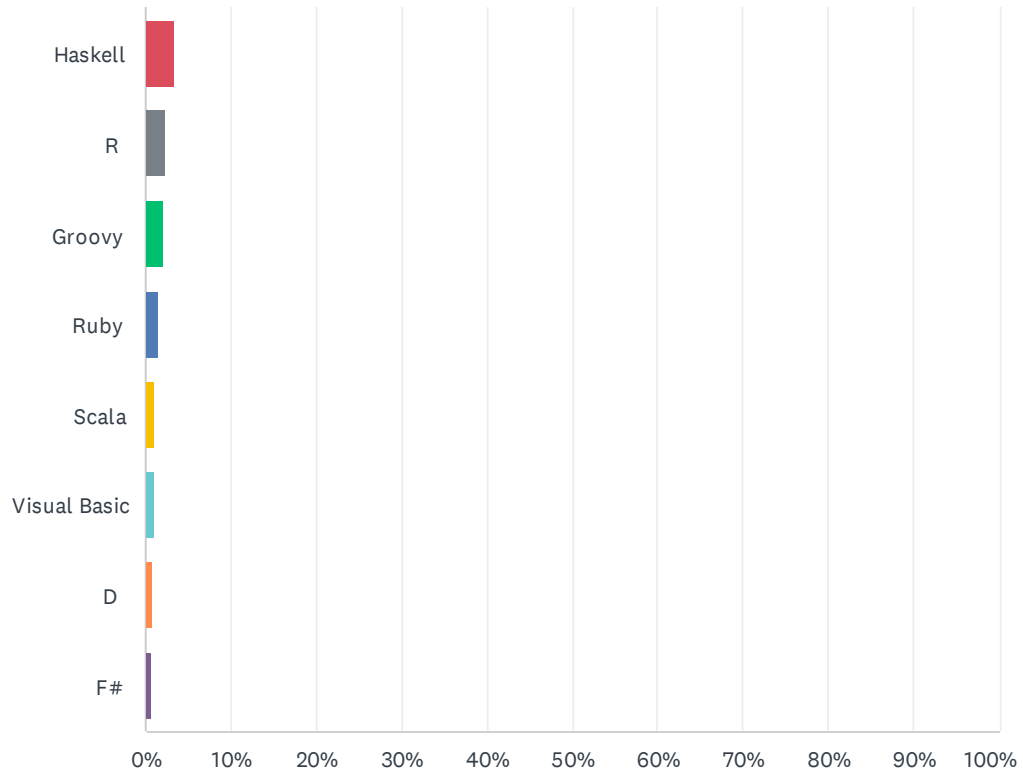
2024 Annual C++ Developer Survey "Lite"

ANSWER CHOICES	RESPONSES	
Python	72.82%	892
C	53.06%	650
JavaScript	27.43%	336
C#	23.76%	291
Rust	18.37%	225
SQL	17.96%	220
Java	16.98%	208
Assembly	16.41%	201
Other (please specify)	14.61%	179
TypeScript	14.53%	178
Lua	12.65%	155
Node.js	10.12%	124
Go	9.55%	117
Objective-C	6.12%	75
Kotlin	5.88%	72
Swift	4.57%	56
Perl	4.41%	54
PHP	4.33%	53
Haskell	3.35%	41
R	2.37%	29
Groovy	2.20%	27
Ruby	1.47%	18
Scala	1.14%	14
Visual Basic	1.14%	14
D	0.90%	11
F#	0.73%	9
Total Respondents: 1,225		

Q17 Which development environments (IDEs) or editors do you use for C++ development?

Answered: 1,245   Skipped: 20
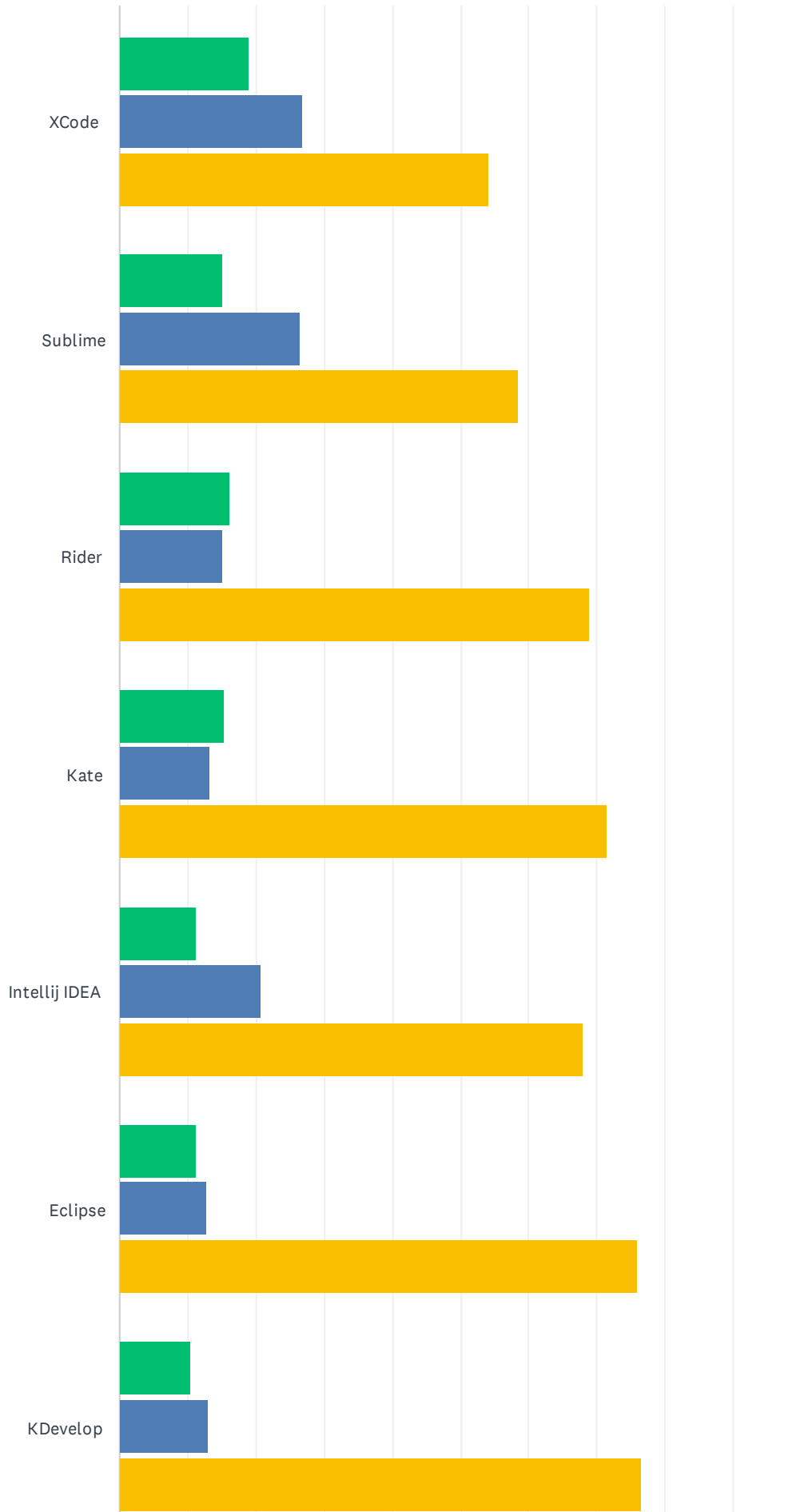
XCode

Sublime

Rider

Kate

Intellij IDEA

Eclipse

KDevelop

2024 Annual C++ Developer Survey "Lite"

- Android Studio
- Code::blocks
- Webstorm
- CodeLite
- Netbeans
- Source Insight
- Atom

2024 Annual C++ Developer Survey "Lite"

Code Insight

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%	
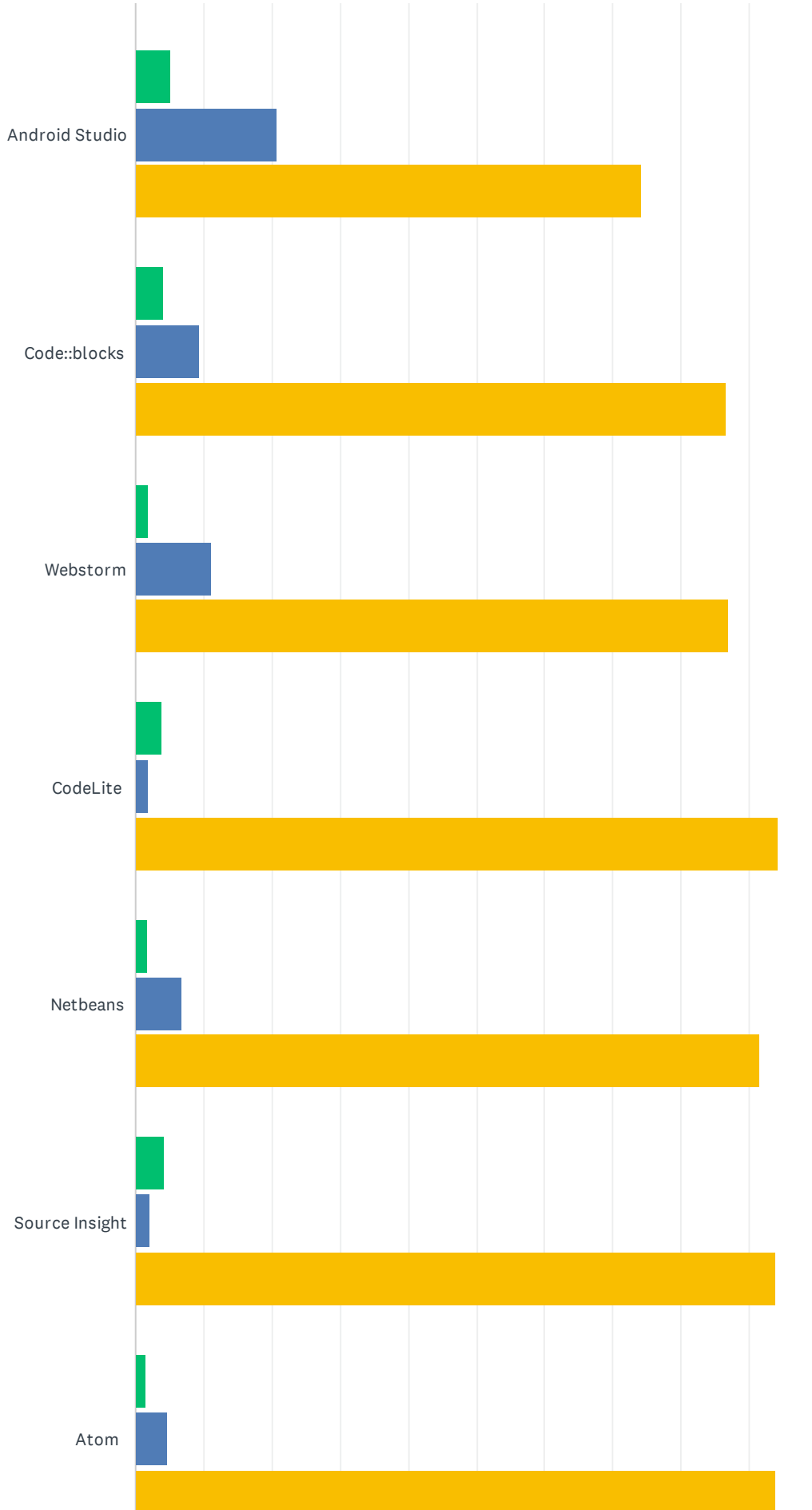
■ Primary   ■ Secondary   ■ Occasional
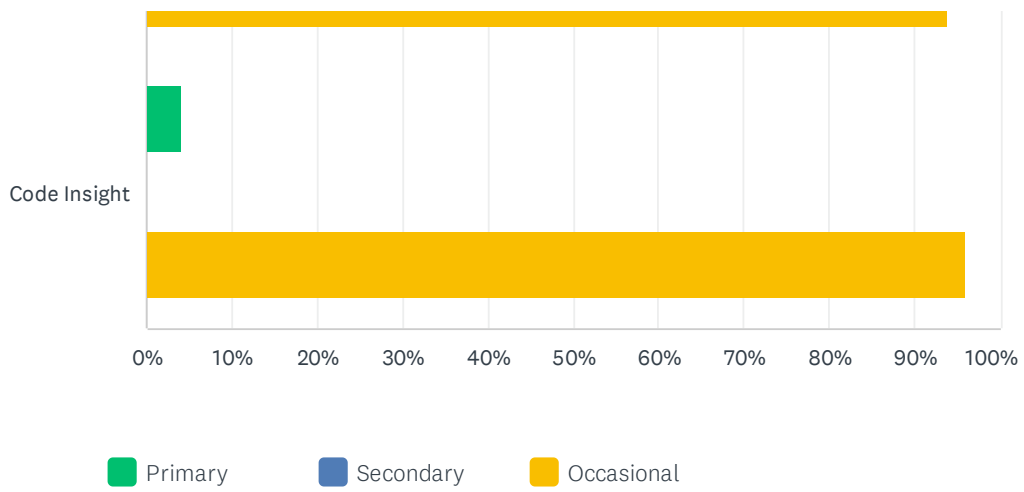
2024 Annual C++ Developer Survey "Lite"

	PRIMARY	SECONDARY	OCCASIONAL	TOTAL	WEIGHTED AVERAGE
Visual Studio	62.03% 415	21.52% 144	16.44% 110	669	2.46
Visual Studio Code	50.27% 469	32.90% 307	16.83% 157	933	2.33
CLion	45.32% 150	20.54% 68	34.14% 113	331	2.11
Vim	36.96% 197	32.08% 171	30.96% 165	533	2.06
Emacs	38.79% 64	18.79% 31	42.42% 70	165	1.96
Qt Creator	25.98% 73	24.56% 69	49.47% 139	281	1.77
XCode	19.02% 39	26.83% 55	54.15% 111	205	1.65
Sublime	15.15% 20	26.52% 35	58.33% 77	132	1.57
Rider	16.13% 15	15.05% 14	68.82% 64	93	1.47
Kate	15.31% 15	13.27% 13	71.43% 70	98	1.44
Intellij IDEA	11.32% 12	20.75% 22	67.92% 72	106	1.43
Eclipse	11.28% 15	12.78% 17	75.94% 101	133	1.35
KDevelop	10.39% 8	12.99% 10	76.62% 59	77	1.34
Android Studio	5.16% 8	20.65% 32	74.19% 115	155	1.31
Code::blocks	4.05% 3	9.46% 7	86.49% 64	74	1.18
Webstorm	1.85% 1	11.11% 6	87.04% 47	54	1.15
CodeLite	3.85% 2	1.92% 1	94.23% 49	52	1.10
Netbeans	1.72% 1	6.90% 4	91.38% 53	58	1.10
Source Insight	4.17% 2	2.08% 1	93.75% 45	48	1.10
Atom	1.54% 1	4.62% 3	93.85% 61	65	1.08
Code Insight	4.08% 2	0.00% 0	95.92% 47	49	1.08

Q18 Which compilers do you use for C++ development?
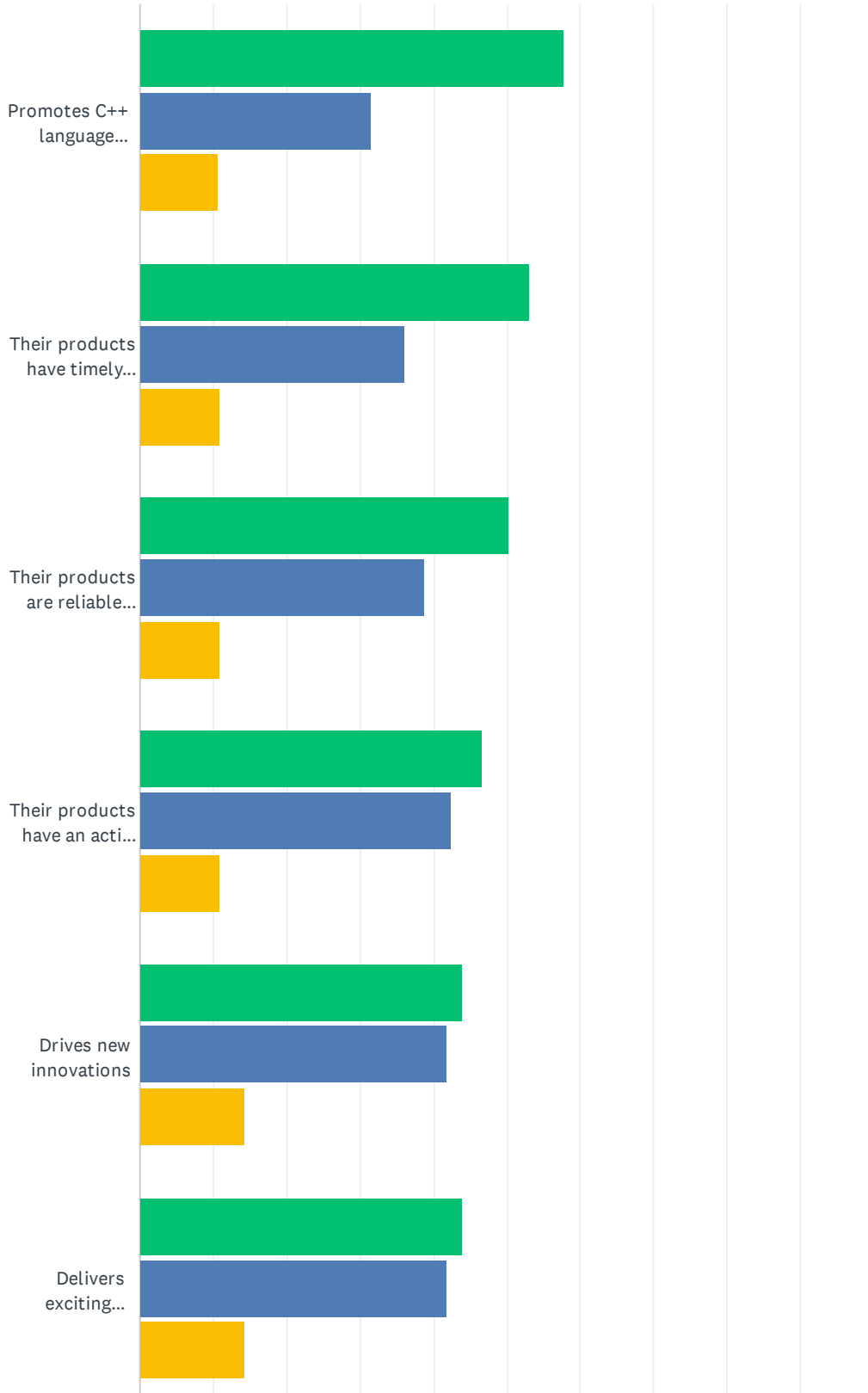
Answered: 1,253   Skipped: 12

Legend: ■ Primary ■ Secondary ■ Occasional

	PRIMARY	SECONDARY	OCCASIONAL	TOTAL	WEIGHTED AVERAGE
GCC	67.45% 742	24.00% 264	8.55% 94	1,100	2.59
MSVC	64.21% 513	17.27% 138	18.52% 148	799	2.46
Clang	44.28% 457	43.51% 449	12.21% 126	1,032	2.32
Custom	32.52% 40	18.70% 23	48.78% 60	123	1.84
Intel	11.54% 21	17.58% 32	70.88% 129	182	1.41

Q19 What organizations come to your mind the most when you think about C++? Why?

Answered: 726   Skipped: 539

Q20 How important is each of these to you when you think about an organization's involvement in C++?

Answered: 1,130   Skipped: 135

Their products have an acti...

Their products have...

Their products are most/all...

Provides outstanding...

Participates actively at...

Actively works toward creat...

Their products have timely...

2024 Annual C++ Developer Survey "Lite"

```
0%   10%   20%   30%   40%   50%   60%   70%   80%   90%   100%
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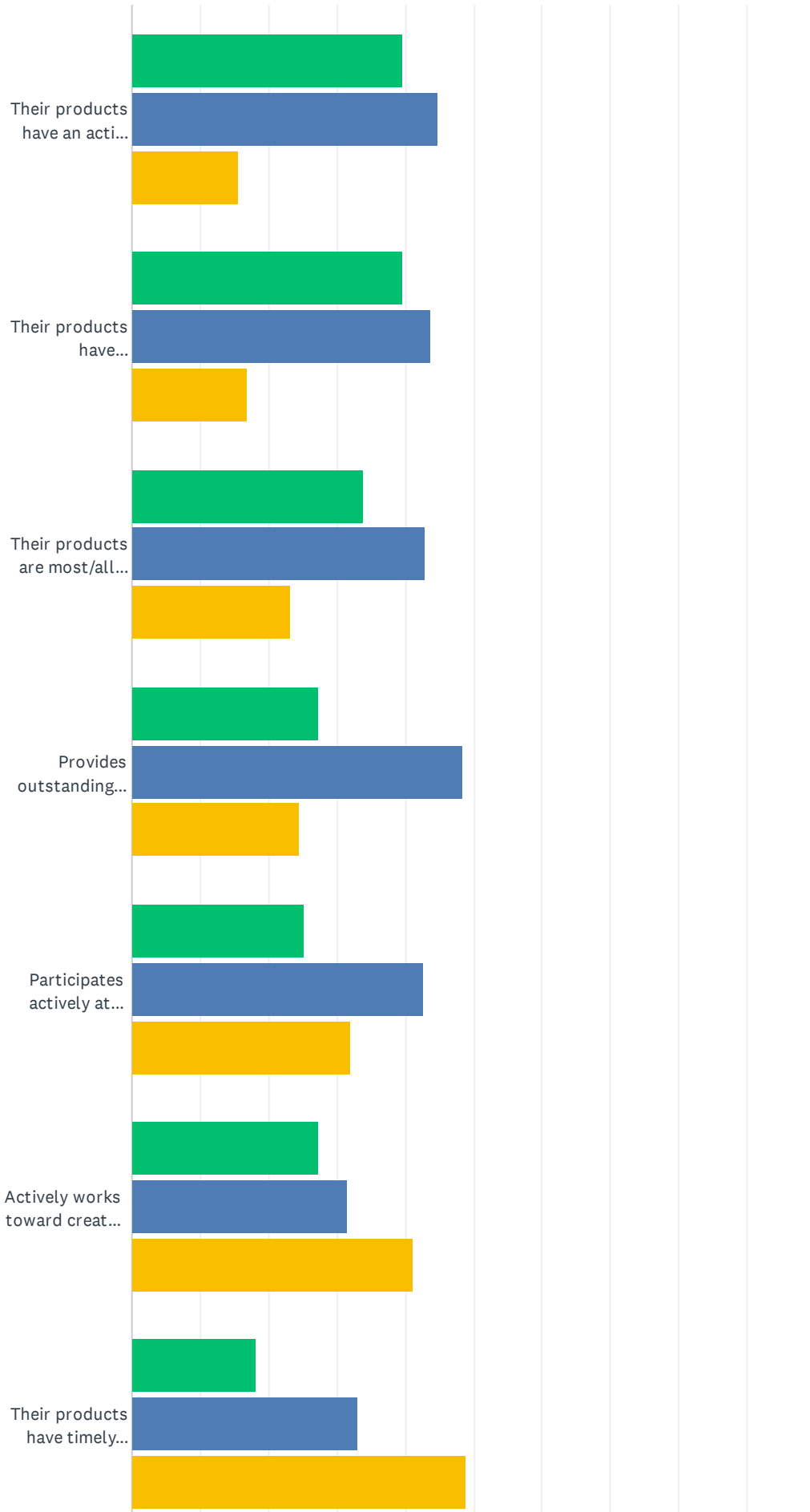
🟩 Very import…   🟦 Somewhat i…   🟨 Not import…

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	TOTAL	WEIGHTED AVERAGE
Promotes C++ language evolution in directions that help my work	57.76% 640	31.50% 349	10.74% 119	1,108	2.47
Their products have timely support for the latest C++ standard	53.07% 587	35.99% 398	10.94% 121	1,106	2.42
Their products are reliable and backward-compatible	50.32% 555	38.80% 428	10.88% 120	1,103	2.39
Their products have an active user community	46.70% 516	42.53% 470	10.77% 119	1,105	2.36
Drives new innovations	43.94% 479	41.74% 455	14.31% 156	1,090	2.30
Delivers exciting solutions to common development problems	43.86% 479	41.85% 457	14.29% 156	1,092	2.30
Their products have an active open source community	39.67% 438	44.75% 494	15.58% 172	1,104	2.24
Their products have high-quality training materials	39.58% 435	43.68% 480	16.74% 184	1,099	2.23
Their products are most/all open-sourced	33.88% 373	42.87% 472	23.25% 256	1,101	2.11
Provides outstanding customer support and servicing	27.21% 296	48.35% 526	24.45% 266	1,088	2.03
Participates actively at conferences (e.g., talks, booths)	25.23% 278	42.74% 471	32.03% 353	1,102	1.93
Actively works toward creating a more diverse and inclusive C++ community	27.31% 302	31.65% 350	41.05% 454	1,106	1.86
Their products have timely support for the latest C standard	18.07% 197	33.12% 361	48.81% 532	1,090	1.69

Q21 Is an organization's involvement in the C++ community a major factor in choosing their developer tools and services?

Answered: 1,159   Skipped: 106
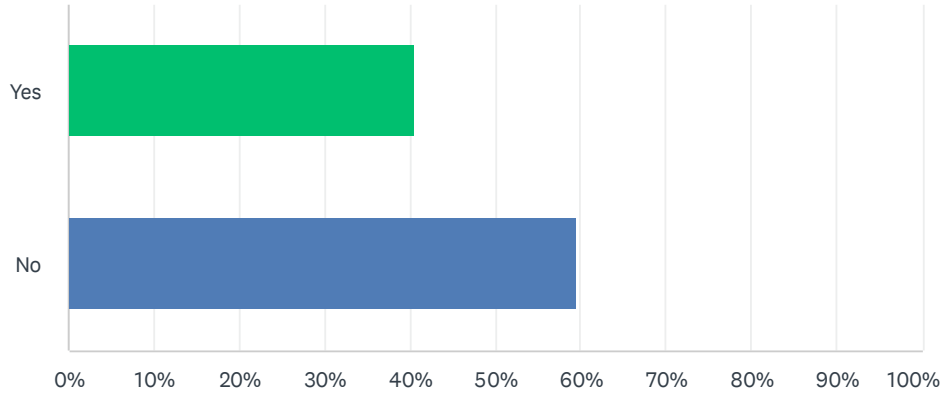
ANSWER CHOICES		RESPONSES	
Yes		40.55%	470
No		59.45%	689
TOTAL			1,159

Q22 If you could wave a magic wand and change one thing about any part of C++, what would it be, and how would that change help your daily work?

Answered: 846   Skipped: 419