

Paper 3 Nov. 19

1) $\frac{13}{50} = \frac{26}{100} = 0.26$

2) $2y = 3x + 5$
 $y = \frac{3}{2}x + \frac{5}{2}$

This is the gradient

This is the y-intercept.

What you get for free when $x = 0$.

3) $(2x - 4)(3x + 5)$
 were interested in just the x -term which is

$5 \times 2x - 4 \times 3x = -2x$
 $-2x$ is one of the options.

4) To 3 sig fig $x = 6.37$

so $6.365 \leq x < 6.375$

5) $7x + 2y = 36$ ①
 $3x + 2y = 16$ ②

subtract ② from ① to eliminate y .

$4x = 20$
 $x = 5$

substitute x back into ①

$7 \times 5 + 2y = 36$

so $y = \frac{1}{2}$

check the answers in ②

$3 \times 5 + 2 \times \frac{1}{2} = 36$ ✓ checks.

6) 100 tiles 40 cost £18
 28 cost £14

It appears to cheapest way is just to buy 3 packs large

$18 \times 3 = £54 - 25\% = £40.50$

and have 20 tiles over.

When tiling you always need a few spares anyway.

6b) Tom needs to multiply not add
 $15 \times 6 = 90$ tiles required.

7. This is a construction

8) Man : Women Total
 $35 : 48$ 83

$\frac{2}{3} \times 35 = 14$: $\frac{1}{3} \times 48 = 18$ 32

No. wearing glasses = 32

b) Not. wearing glasses 51
 Prob (glasses) = $\frac{51}{83}$

9) Women Men Difference
 65° 35° 30°
 $= 450$

$\frac{450}{30} = 15$ people/degree

children = $360 - 65 - 35$
 $= 260$

No. children = $260 \times 15 = 3900$

10) density = $\frac{\text{mass}}{\text{volume}}$ $\frac{m}{V}$

so $\frac{m}{2} \sqrt{x \times 4} = \frac{1}{8} \frac{m}{V}$

so new density $\div 8$

11) ratio $\sqrt[3]{512} : 10.4$

$\times 2 \left(\begin{array}{l} 8 : 2.5 \\ 16 : 5 \end{array} \right) \times 2$
 $\div 5 \left(\begin{array}{l} 3.2 : 1 \end{array} \right) \div 5$

12)

Higher rate pay $\frac{350 - 280}{40 - 35} = £14/\text{hr.}$

Basic rate pay $\frac{280 - 0}{35 - 0} = £8/\text{hr.}$

Difference = £6/hr.

13) Total No. Books read in month = 52

$$\text{Average per person} = \frac{52}{5}$$

$$\text{Estimated per year} = \frac{52}{5} \times 12 = 125$$

Alternatively we could have analysed each person separately and would have concluded 4 out of 5 people read more than 100 books/year. This would be a better method.

criticisms are

- 1) 5 is a small sample.
- 2) Reading per month may not equate to year. The sample could have been taken in winter when people read more.

14) $y = x^3 + a \quad (3, 29)$

$$29 = 3^3 + a \text{ so } a = 2$$

We then plot graph

x	y
-3	-25
-2	-6
-1	1
0	2
1	3
2	10
3	29

15) Kim had paid £9260 tax

$$£37500 \times 0.2 = £7500$$

$$\text{so } x \times 0.4 = 9260 - 7500$$

$$x = £4400$$

$$\text{so earnings are } \begin{array}{r} 12500 + \\ 37500 + \\ 4400 \\ \hline £54400 \end{array}$$

Kim could be a teacher.

16) 2 labourers
14 joiners
9 electricians
8 plumbers.

No ways choosing 4 workers = 2016 ✓

if 1 labourer 1 plumber 6

No ways choosing 4 workers = 756 ✓
(we just multiply the numbers)

17) $f(x) = 3x^2 - 4x + 8$

Jenny says $f(10) = 2 \times f(5)$
let's see

$$f(10) = 3 \times 10^2 - 4 \times 10 + 8 = 268$$

$$f(5) = 3 \times 5^2 - 4 \times 5 + 8 = 63 \text{ so } 2 \times f(5) = 126$$

Jenny doesn't understand functions.

18) $(7x+1)(2x-3) = 0$

so roots are $7x = -1$
 $x = -1/7$ ✓

or $2x = 3$
 $x = 3/2$ ✓

circle these numbers.

19) $\tan DBH = \frac{8}{13}$
 $\angle DBH = \tan^{-1} 8/13$
 $= 31.6^\circ$ ✓

and $\angle ECG = \angle DBH$
so $\angle ECG = 31.6^\circ$

20) equation circle is $x^2 + y^2 = r^2$

$$(-1, 1) \Rightarrow (-1)^2 + (1)^2 = r^2$$

$$\text{so } r^2 = 2$$

$$r = \sqrt{2}$$
 ✓

21) small : large

Volume 6 : 5 bottles $\times 225$
 so 450 : 1125

Now 1 small bottle $\equiv$ 6 small glasses

so small glass = $\frac{450}{6}$
 = 75 ml.

small : large

$\times 18.75$ 6 : 4 : 7 glasses
 75 131.25

finally $\frac{1125}{131.25} = 8.57..$

so 8 large glasses

22) $x^2 + bx + c = 0$

if only solution is $x = 5$

then $(x - 5)^2 = 0$

$(x - 5)^2 = x^2 - 10x + 25$

so $b = -10$
 $c = 25$

23) $x : y$

$\frac{1}{4} : \frac{2}{3}$

so $\frac{2}{3}x = \frac{1}{4}y$

remember swap over.

$x = \frac{3}{8}y$

24) Transformation is

Enlargement by $-\frac{1}{2}$
 about $(1, -1)$

(3 pieces of information)

25) The area of the graph represents distance.

Split the graph into 4 areas.

large triangle = $\frac{1}{2} \times 5 \times 102$

rectangle = 40×102

small triangle = $\frac{1}{2} \times 15 \times (102 - 96)$

final rectangle = 15×96

However the time is minutes so we need to divide answer by 60

$\frac{5820}{60} = 97 \text{ km.}$

Distance remaining $130 - 97$
 = 33 km

26) Area of sail =

$\frac{1}{2} \times 3.8 \times 9.7 \times \sin 73^\circ$
 = 17.62...

Paint needed = $6 \times 17.62...$

Bottles needed = $\frac{6 \times 17.62...}{8.5}$

In practice we hold area of sail in our calculator.

Answer = 12.4...

therefore 13 bottles

26b)

We need to find length of sail join

$c^2 = a^2 + b^2 - 2ab \cos C$
 = $9.7^2 + 3.8^2 - 2 \times 9.7 \times 3.8 \cos 73^\circ$
 $c = 9.32...$

then $\frac{\sin x}{9.32} = \frac{\sin 42}{8}$

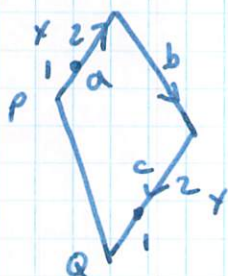
$x = \sin^{-1} \frac{9.32 \sin 42}{8}$

In practice we hold the 9.32 in our calculator and use the Ans. button.

if we work all this out correctly we should get

$x = 51.3^\circ$

27)



$$\vec{PQ} = a + b + c$$

$$\vec{XY} = \frac{2}{3}a + b + \frac{2}{3}c$$

So $\vec{XY}$ is not parallel to $\vec{PQ}$
as it is not an integer
proportion.

Note: strictly there is insufficient
information. Specific values
of a and b could mean
 $XY \parallel PQ$.

28)

$$f(x) = 2x - 3$$

$$g(x) = x^2$$

$$f^{-1}(55) = fg(4) \text{ prove.}$$

$$y = 2x - 3$$

$$2x = y + 3$$

$$x = \frac{y+3}{2}$$

$$\text{So } f^{-1}(55) = \frac{55+3}{2}$$

$$= 29$$

$$fg(x) = 2x^2 - 3$$

$$fg(4) = 2(4)^2 - 3$$

$$= 29$$

agree

So we have proved.

ROBERT GOODHAND