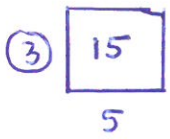
Grade A - A* Revision Passport

MR BARTON'S SOLUTIONS

Histograms

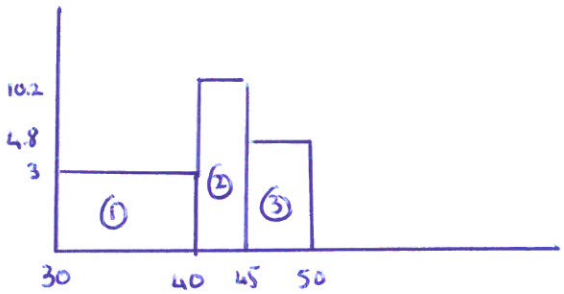
using key:



so, one big square has a height (Freq Density) of 3

So, each tiny square = $\frac{3}{5}$ = 0.6 height, or each row of 5 = 3 people

a) Fewer than 50 miles:



Need Area for Frequency:

① $10 \times 3 = 30$

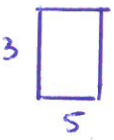
② $5 \times 10.2 = 51$

③ $5 \times 4.8 = 24$

105 people

b) Between 35 & 50

From above, but need to subtract 30 - 35



$3 \times 5 = 15$ → $105 - 15 = 90$ people

c) Need all 105 from part a) (< 50) = 105

\+ 50 - 55 = $5 \times 4.8 = 24$

\+ 65 - 70 = $5 \times 7.8 = 39$

168 people

Simultaneous Equations

a) ① $y + x = 3$

② $x^2 + y^2 = 5$

① → $y = 3 - x$

Sub ① into ②

→ $x^2 + (3-x)^2 = 5$

→ $x^2 + (3-x)(3-x) = 5$

$x^2 + 9 - 6x + x^2 = 5$

$2x^2 - 6x + 9 = 5$

$2x^2 - 6x + 4 = 0$

$\div 2$ { $x^2 - 3x + 2 = 0$

FACT $(x - 2)(x - 1) = 0$

$x - 2 = 0$

→ $\boxed{x = 2}$

$y = 3 - x$

→ $y = 3 - 2$

→ $\boxed{y = 1}$

$x - 1 = 0$

→ $\boxed{x = 1}$

$y = 3 - x$

→ $y = 3 - 1$

→ $\boxed{y = 2}$

b) ① $y = 2x + 4$

② $4x^2 + 4 = y$

Sub ① into ②

→ $4x^2 + 4 = 2x + 4$

$-2x$ { $4x^2 - 2x + 4 = 4$

-4 { $4x^2 - 2x = 0$

$\div 2$ { $2x^2 - x = 0$

FACT $x(2x - 1) = 0$

$x(2x-1) = 0$

$x = 0$

$y = 2x + 4$

$\rightarrow y = 2(0) + 4$

$\rightarrow \boxed{y = 4}$

$2x - 1 = 0$

$\rightarrow 2x = 1$

$\rightarrow \boxed{x = 0.5}$

$y = 2x + 4$

$\rightarrow y = 2(0.5) + 4$

$\rightarrow \boxed{y = 5}$

Cumulative Freq

See Grade C answers

Change the Subject

a) $a(x + p) = bx + t$

$ax + ap = bx + t$

$-bx$: $ax + ap - bx = t$

$-ap$: $ax - bx = t - ap$

FACT : $x(a - b) = t - ap$

$\div (a-b)$: $x = \frac{t - ap}{a - b}$

b) $\frac{p}{x+t} = \frac{y}{x+t}$

$\times (x+t)$: $\frac{p(x+t)}{x+t} = \frac{y(x+t)}{x+t}$

$\rightarrow p(x+t) = y(x+t)$

$px + pt = yx + yt$

$$px + pt = yx + yt$$

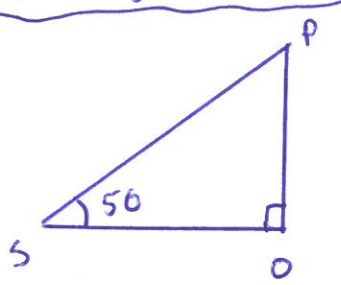
$-yx$: $px - yx + pt = yt$

$-pt$: $px - yx = yt - pt$

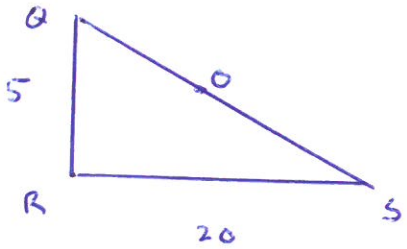
FACT: $x(p - y) = yt - pt$

$\div (p-y)$: $x = \dfrac{yt - pt}{p - y}$

3D Trigonometry



1st need box: OS

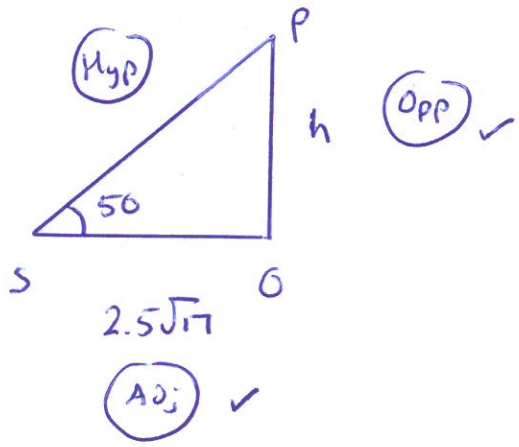


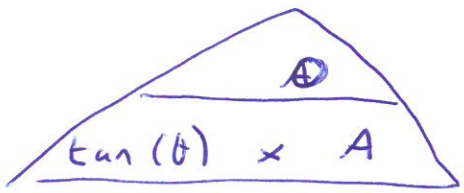
$$QS = \sqrt{20^2 + 5^2}$$

$$= \sqrt{452} = 5\sqrt{17}$$

$$OS = \frac{1}{2} QS = \frac{1}{2}(5\sqrt{17})$$

$$= 2.5\sqrt{17}$$





$$Opp = \tan(\theta) \times Adj$$

$$\rightarrow h = \tan(50) \times 2.5\sqrt{17}$$

$$= 12.284\ldots \text{ m}$$

Box Plots

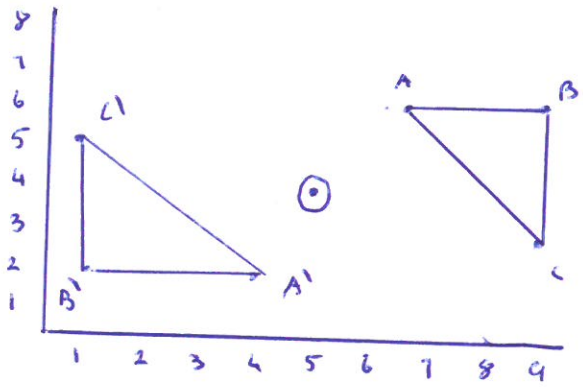
① Medians

Class 1 had a higher median (80%) than Class 2 (75%).
This means on average they did better in the test

② IQR

Class 1 has a smaller IQR (14%) than Class 2 (20%).
This means their scores were more consistent

Enlargement



New co-ordinates:

(A) (6,6) → (4,2)

(B) (9,6) → (6,2)

(C) (9,3) → (1,5)

Solving Quadratics

a) $x^2 + 7x + 12 = 0$

$(x + 4)(x + 3) = 0$

$x + 4 = 0$ → $\boxed{x = -4}$

$x + 3 = 0$ → $\boxed{x = -3}$

$2x^2 - 7x - 15 = 0$

$(2x + 3)(x - 5) = 0$

$2x + 3 = 0$

$2x = -3$

→ $\boxed{x = -\frac{3}{2} \text{ or } -1.5}$

$x - 5 = 0$

→ $\boxed{x = 5}$

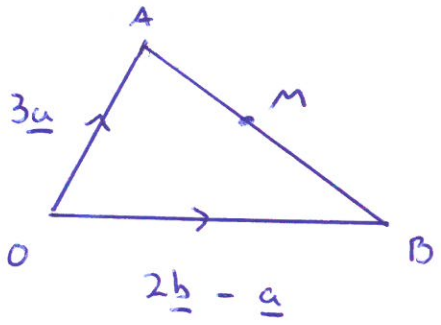
Area of a Sector

$$A = \frac{\theta}{360} \times \pi r^2$$

$$\text{Area} = \frac{134}{360} \times \pi \times 6^2$$

$$= 42.0973\ldots \text{ cm}^2$$

Vectors



a) $\vec{AB} = \vec{AO} + \vec{OB}$

$= -3a + 2b - a$

$= -4a + 2b$

b) $\vec{AM} = \frac{1}{2}\vec{AB}$

$= \frac{1}{2}(-4a + 2b)$

$= -2a + b$

3D Co-ordinates

A = (0, 0, 0)

B = (12, 0, 0)

C = (12, 10, 0)

D = (0, 10, 0)

E = (0, 0, 4)

F = (12, 0, 4)

G = (12, 10, 4)

H = (0, 10, 4)

Circle Theorems

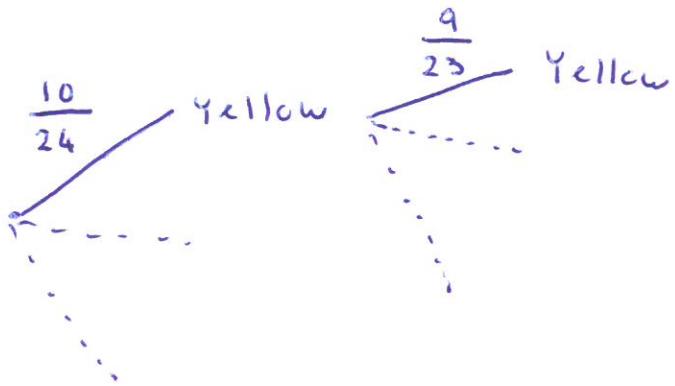
ABCD is a cyclic Quadrilateral

→ $\angle C = 180 - 75 = 105^\circ$

opposite angles in a cyclic Quadrilateral add to 180°.

Probability

Only need to think about one bit of the tree diagram:



$$P(Y,Y) = \frac{10}{24} \times \frac{9}{23}$$

$$= \frac{90}{552} = \frac{15}{92}$$

Compound Interest

use 2m = 200 cm

a) After 1 bounce: $200 \times 0.88 = 176$

After 2 bounces: $176 \times 0.88 = 154.88$

After 3 bounces: $154.88 \times 0.88 = 136.29...$ cm

b) 8 bounces: $200 \times 0.88^8 = 71.926...$ cm

c) 10 bounces: $200 \times 0.88^{10} = 55.700...$ cm

Quadratic Graphs

See Grade C answers

Standard Form

a) $1.2 \times 10^3 = 1200$

$2.1 \times 10^{-2} = 0.021$

$1.02 \times 10^{-3} = 0.00102$

order:

1.02×10^{-3}

2.1×10^{-2}

1.2×10^3

2100

b) $(3.2 \times 10^3) \times (2.4 \times 10^5)$

$= 3.2 \times 2.4 \times 10^3 \times 10^5$

$= 7.68 \times 10^8$

Inverse Proportion

$$y \propto \frac{1}{x^2}$$

$$y = \frac{k}{x^2} \longrightarrow y = \frac{162}{x^2}$$

$$18 = \frac{k}{3^2}$$

$\rightarrow 18 \times 3^2 = k$

$\rightarrow k = 162$

Rationalising Surds

a) $\frac{5}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{5\sqrt{7}}{7}$

b) $\frac{2\sqrt{3}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{15}}{5}$

c) $\frac{\sqrt{6}}{4+3\sqrt{2}} \times \frac{4-3\sqrt{2}}{4-3\sqrt{2}} = \frac{4\sqrt{6} - 3\sqrt{12}}{16 + 12\sqrt{2} - 12\sqrt{2} - 9\sqrt{4}}$

$= \frac{4\sqrt{6} - 3\sqrt{4}\sqrt{3}}{16 - 18}$

$$= \frac{4\sqrt{6} - 6\sqrt{3}}{-2} = -2\sqrt{6} + 3\sqrt{3}$$