

RUNNING NOTES

Simple equations (on integers)

Teacher's handwritten notes, typed

| $\rightarrow x + 2 = 8$ then $x = ?$

Ans $x = 6$

Sol $x + 2 = 8$

$$\Rightarrow x = 8 - 2$$

$$\Rightarrow x = 6$$

($\Rightarrow$ implies)

| $\rightarrow x + 5 = 11$ then $x = ?$

Sol $x + 5 = 11$

$$\Rightarrow x = 11 - 5$$

$$\Rightarrow x = 6$$

| $\rightarrow x + 7 = -8$ then $x = ?$

Sol $x + 7 = -8$

$$\Rightarrow x = -8 - 7$$

$$\Rightarrow x = -15$$

$$8 + 7 = 15$$

$$-8 - 7 = -15 \checkmark$$

| $\rightarrow x - 2 = 4$ then $x = ?$

Ans $x = 6$

Sol $x - 2 = 4$

$$\Rightarrow x = 4 + 2$$

$$\Rightarrow x = 6$$

| $\rightarrow x - 8 = -15$ then $x = ?$

Sol $x - 8 = -15$

$$\Rightarrow x = -15 + 8$$

$$\Rightarrow x = -7$$

| $\rightarrow x - 8 = -2$ then $x = \underline{\hspace{1cm}}$

Sol $x - 8 = -2$

$$\Rightarrow x = -2 + 8$$

$$\Rightarrow [x = 6] \checkmark$$

$$8 + 7 = 15$$

$$-9 - 3 = -12$$

$$-9 + 3 = -6$$

$$-9 + 12 = 3$$

$$\rightarrow x - 15 = -27 \text{ then } x = ?$$

Sol $x - 15 = -27$
 $\Rightarrow x = -27 + 15$
 $\Rightarrow x = -12$

[column subtraction: $27 - 15 = 12$]

HW ① $x + 125 = 256$ then find x

② $x + 12 = -28$ then find x

③ $x - 19 = 32$ then find x

④ $x - 27 = -45$ then find x

$$\rightarrow x \times 2 = 12 \text{ then } x = ?$$

Ans $x = 6$

Sol $x \times 2 = 12$
 $\Rightarrow x = \frac{12}{2}$ [cancelled, 6 written above]
 $\Rightarrow x = 6$

$$\rightarrow 5 \times x = 125 \text{ then } x = ?$$

Sol $5 \times x = 125$
 $\Rightarrow x = \frac{125}{5}$ [cancelled, 25 written above]
 $\Rightarrow x = 25.$

$$\rightarrow \frac{x}{2} = 20 \text{ then } x = \underline{\hspace{2cm}}$$

Ans $x = 40$

Sol $\frac{x}{2} = 20$
 $\Rightarrow x = 20 \times 2$
 $\Rightarrow x = 40$

$$\rightarrow \frac{x}{4} = 125 \text{ then } x = \underline{\hspace{2cm}}$$

Sol $\frac{x}{4} = 125.$
 $\Rightarrow x = 125 \times 4$
 $\Rightarrow x = 500$

Note: 1) $x + a = b$ then $x = b - a$

2) $x - a = b$ then $x = b + a$

3) $x(a) = b$ then $x = \frac{b}{a}$

4) $\frac{x}{a} = b$ then $x = b \times a$.

Ex ① $x + 5 = -13$ then $x =$

② $x - 5 = -12$ then $x =$

③ $x \times 5 = 250$ then $x =$

④ $\frac{x}{23} = 2536$ then $x =$

Sol ① $x + 5 = -13$

$$\Rightarrow x = -13 - 5$$

$$\Rightarrow x = -18$$

Ans 1) -18 ✓

2) -7 ✓

3) 50 ✓

4) 58328 ✓

② $x - 5 = -12$

$$\Rightarrow x = -12 + 5$$

$$\Rightarrow x = -7$$

③ $x \times 5 = 250$

$$\Rightarrow x = \frac{250}{5} \text{ [cancelled, 50 written above]}$$

$$\Rightarrow x = 50$$

④ $\frac{x}{23} = 2536$

$$\Rightarrow x = 2536 \times 23$$

$$\Rightarrow x = 58328$$

[column multiplication: $2536 \times 23 = 7608 + 50720 = 58328$]

H.W ① $x + 25 = -96$ then $x =$

② $x - 125 = -13$ then $x =$

③ $x \times 3 = 101010$ then $x =$

④ $\frac{x}{27} = -12$ then $x =$

Ex: $x - 102 = -508$ then $x = \underline{\hspace{2cm}}$

Sol $x - 102 = -508$
 $\Rightarrow x = -508 + 102$
 $\Rightarrow x = -406$

Ans -406

[column subtraction: $508 (-) 102 = 406$]

Ex $x + 20503 = 102308$ then $x = \underline{\hspace{2cm}}$

Sol $x + 20503 = 102308$
 $\Rightarrow x = 102308 - 20503$
 $= 81805$

[column subtraction: 102308 regrouped (0 10 1 13), $(-) 20503$, answer 81805]

Ex Solve $x \times 24 = 28872$

[arrow from "Solve": we find x]

Sol $x \times 24 = 28872$
 $\Rightarrow x = \frac{28872}{24}$
 $= 1203$

Ans 1203

$$\begin{array}{r} 24 \) \ 28872 \ (\ 1203 \\ \underline{(-) \ 24} \\ 48 \\ \underline{(-) \ 48} \\ 072 \\ \underline{72} \\ (0) \end{array}$$

Ex Solve $\frac{x}{-12} = 513$

Sol $\frac{x}{-12} = 513$
 $\Rightarrow x = 513 \times -12$
 $\Rightarrow x = -6156$

Ans -6156

Ans 6156

[column multiplication: $513 \times 12 = 6156$]

$$\begin{array}{r} + \times + = + \\ - \times - = + \\ + \times - = - \end{array}$$

$$- \times + = -$$

→ Solve $2x + 8 = -16$

Sol $2x + 8 = -16$

$$\Rightarrow 2x = -16 - 8$$

$$\Rightarrow 2x = -24$$

$$\Rightarrow x = -\frac{24}{2} \text{ [cancelled, 12 written above]}$$

$$\Rightarrow [x = -12]$$

Ans $x = 18$

Ans $[x = -12] \checkmark$

$$16 + 8 = 24$$

$$-16 - 8 = -24$$

$$2x = 2 \times x.$$

→ Solve $2x - 8 = -12$

Sol $2x - 8 = -12$

$$\Rightarrow 2x = -12 + 8$$

$$\Rightarrow 2x = -4$$

$$\Rightarrow x = -\frac{4}{2} \text{ [cancelled, 2 written above]}$$

$$\Rightarrow [x = -2]$$

Ans: -2

H.W solve

① $5x - 12 = 3$

② $10x + 20 = 40$

③ $8x - 12 = 4$

④ $8 - 2x = -12$

→ Solve $3x - 128 = -3$

Sol $3x - 128 = -3$

$$\Rightarrow 3x = -3 + 128$$

$$\Rightarrow 3x = 125$$

$$\Rightarrow x = \frac{125}{3}$$

$$3x = 3 \times x$$

→ Solve $\frac{x}{5} + 125 = -95$

Sol $\frac{x}{5} + 125 = -95$
 $\Rightarrow \frac{x}{5} = -95 - 125.$
 $\Rightarrow \frac{x}{5} = -220$
 $\Rightarrow x = -220 \times 5$
 $\Rightarrow x = -1100$

Ans (-1100) ✓

[column addition: $125 + 95 = 220$]

[column multiplication: $220 \times 5 = 1100$]

→ Solve $\frac{2x}{3} + 5 = -7$

Sol $\frac{2x}{3} + 5 = -7$
 $\Rightarrow \frac{2x}{3} = -7 - 5$
 $\Rightarrow \frac{2x}{3} = -12$
 $\Rightarrow 2x = -12 \times 3$
 $\Rightarrow 2x = -36$
 $\Rightarrow x = -\frac{36}{2}$ [cancelled, 18 written above]
 $\Rightarrow x = -18$

Ans -18 ✓

(-36) ✗

→ Solve $\frac{5x}{6} + 7 = -18$

Sol $\frac{5x}{6} + 7 = -18$
 $\Rightarrow \frac{5x}{6} = -18 - 7$
 $\Rightarrow \frac{5x}{6} = -25$
 $\Rightarrow 5x = -25 \times 6$
 $\Rightarrow 5x = -150$
 $\Rightarrow x = -\frac{150}{5}$ [cancelled, 30 written above]
 $\Rightarrow x = -30.$

Ans (-30)

$$(-18) \text{ X}$$

$$\left(-\frac{156}{5}\right) \text{ X}$$

H.W Solve

$$\textcircled{1} \frac{3x}{7} + 7 = -23$$

$$\textcircled{2} \frac{5x}{6} - 30 = 170$$

$$\textcircled{3} 2x + 128 = -256$$

Sol $\textcircled{1} \frac{3x}{7} + 7 = -23$

$$\Rightarrow \frac{3x}{7} = -23 - 7$$

$$\Rightarrow \frac{3x}{7} = -30$$

$$\Rightarrow 3x = -30 \times 7$$

$$\Rightarrow x = -\frac{30 \times 7}{3} \text{ [cancelled, 10 written above]}$$

$$\Rightarrow x = -70$$

$$\textcircled{2} \frac{5x}{6} - 30 = 170$$

$$\Rightarrow \frac{5x}{6} = 170 + 30$$

$$\Rightarrow \frac{5x}{6} = 200$$

$$\Rightarrow 5x = 6 \times 200$$

$$\Rightarrow x = \frac{6 \times 200}{5} \text{ [cancelled, 40 written above]}$$

$$\Rightarrow [x = 240]$$

$$\textcircled{3} 2x + 128 = -256$$

$$\Rightarrow 2x = -256 - 128$$

$$\Rightarrow 2x = -384$$

$$\Rightarrow x = -\frac{384}{2} \text{ [cancelled, 192 written above]}$$

$$\Rightarrow x = -192$$

→ **Solve** $x - 2 = 8 - x$

[arrows showing -2 moving to the right side and $-x$ moving to the left side]

Sol Given $x - 2 = 8 - x$

$$\Rightarrow x + x = 8 + 2$$

$$\Rightarrow 2x = 10$$

$$\Rightarrow x = \frac{10}{2} \text{ [cancelled, 5 written above]}$$

$$\Rightarrow x = 5.$$

$$a + a = 2a$$

$$p + p = 2p$$

$$x + x = 2x$$

→ Solve $3x - 10 = 15 - 2x$.

Sol $3x - 10 = 15 - 2x$

[arrows showing -10 moving right and $-2x$ moving left]

$$\Rightarrow 3x + 2x = 15 + 10$$

$$\Rightarrow 5x = 25$$

$$\Rightarrow x = \frac{25}{5} \text{ [cancelled, 5 written above]}$$

$$\Rightarrow x = 5.$$

Ans: 5

$$3a + 2a = 5a$$

→ Solve $7x - 3 + 3x = 11 + 8x$.

Sol Given $7x - 3 + 3x = 11 + 8x$

[arc joining $7x$ and $3x$]

$$\Rightarrow 10x - 3 = 11 + 8x$$

[arrows showing -3 moving right and $8x$ moving left]

$$\Rightarrow 10x - 8x = 11 + 3$$

$$\Rightarrow 2x = 14$$

$$\Rightarrow x = \frac{14}{2} \text{ [cancelled, 7 written above]}$$

$$\Rightarrow x = 7$$

Ans 7

$$10a - 8a = 2a$$

Solve $8x + 123 = -256 + 9x$.

Sol $8x + 123 = -256 + 9x$

[arrows showing 123 moving right and $9x$ moving left]

$$\Rightarrow 8x - 9x = -256 - 123$$

$$\Rightarrow (-1)x = -379$$

$$\Rightarrow x = -\frac{379}{-1}$$

$$\Rightarrow x = 379$$

Ans -379

Ans 379 ✓

$$8 - 9$$

$$= -1$$

$$(- \div - = +)$$

[column addition: $256 + 123 = 379$]

HW Solve.

① $5x - 7 = -9 + 3x$.

② Solve $\frac{3x}{2} + 9 = -9$

③ Solve $-13x + 7 - 14x = -47$

→ The sum of two integers is -34 . If one of them is 55 , then find the other

Sol $[x] + [55] = -34$ ✓

$$\Rightarrow x = -34 - 55$$

$$\Rightarrow x = -89$$

Ans: -21

Ans: 89

Ans 21

Ans -89 ✓

→ The sum of two integers is 1982 . If one of them is 1947 , then find the other

Sol $x + 1947 = 1982$

$$\Rightarrow x = 1982 - 1947$$

$$\Rightarrow x = 35.$$

Ans: (37)

Ans 35 ✓

[column subtraction: 1982 regrouped $(7\ 12)$, -1947 , answer 35]

→ What number should be added to 57 to get -75 ?

Sol $57 + x = -75$

$$\Rightarrow x = -75 - 57$$

$$\Rightarrow x = -132$$

Ans: -18

Ans -132

→ What number should be subtracted from -6 to get -5 ?

Sol $-6 - x = -5$
 $\Rightarrow -x = -5 + 6$
 $\Rightarrow -x = 1$
 $\Rightarrow x = -1$

Ans -1

Ans 1

→ The product of two integers is 154 . If one of them is -14 , then find the other

Sol: $x \times -14 = 154$
 $\Rightarrow x = \frac{154}{-14}$
 $\Rightarrow x = -11$

$14 \mid 154 \quad (11)$

$(-)\ 14$

14

14

(0)

H.W

- ① The product of two integers is 105 . If one of them is -7 , find the other.
- ② The difference of two integers is 18 . If one of them is -40 , then find the other.
- ③ The sum of two integers is 121 . If one of them is 29 , then find the other.